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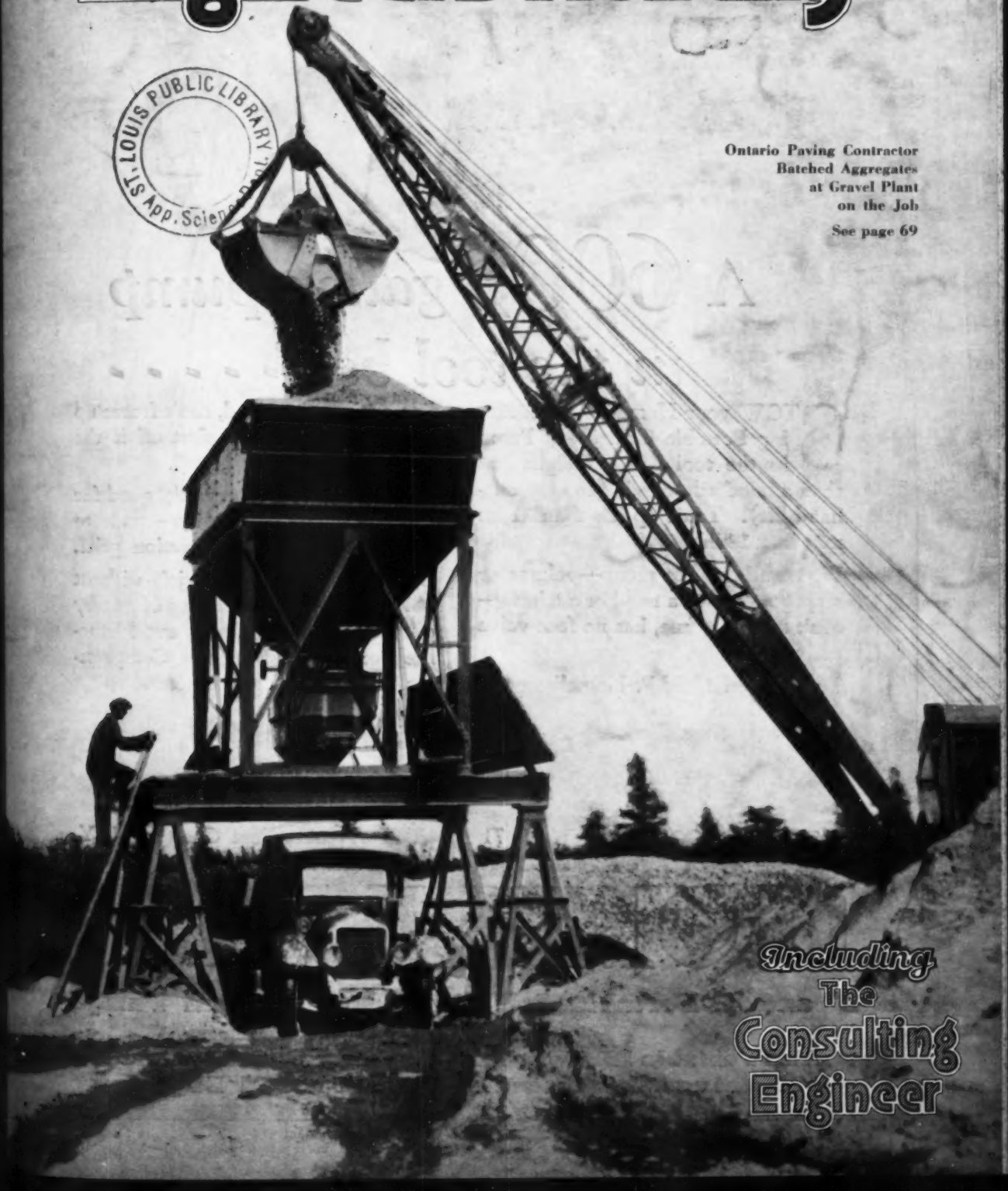
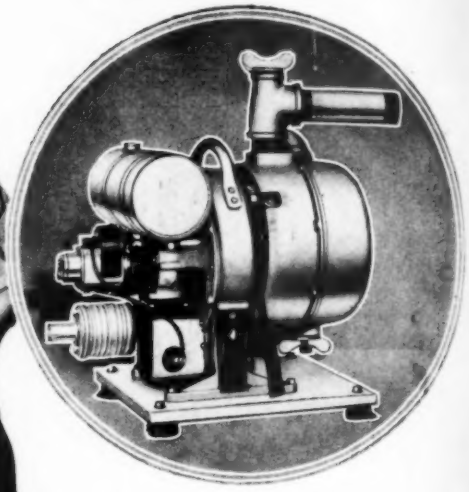
Ontario Paving Contractor Batched Aggregates at Gravel Plant on the Job

See page 69



Including The Consulting Engineer



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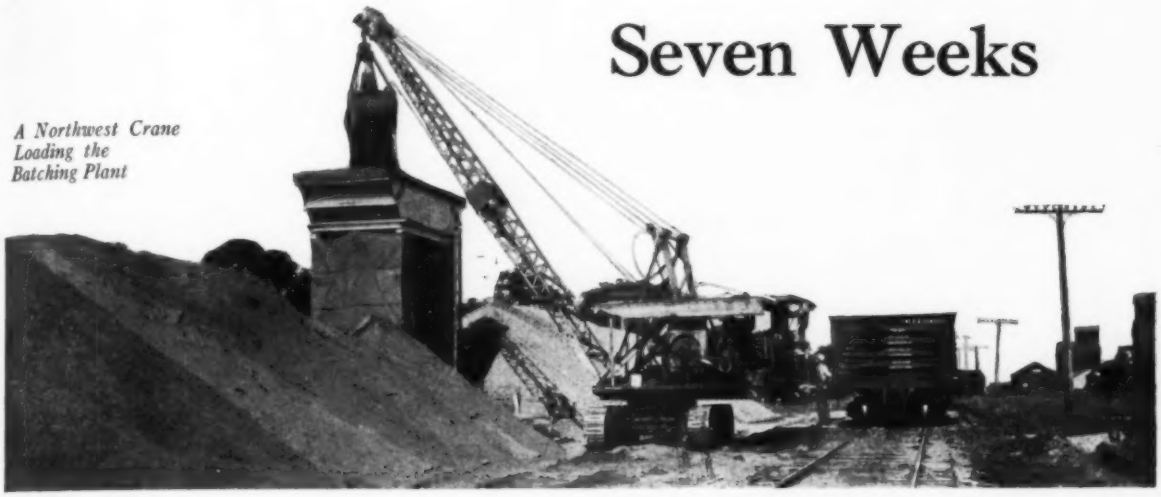
Paving Seven Miles *in* Seven Weeks



A Northwest Crane Loading the Batching Plant

G. G. Herrick of Des Moines Used Single Paver and Poured 100 Feet per Hour Average for Entire Job

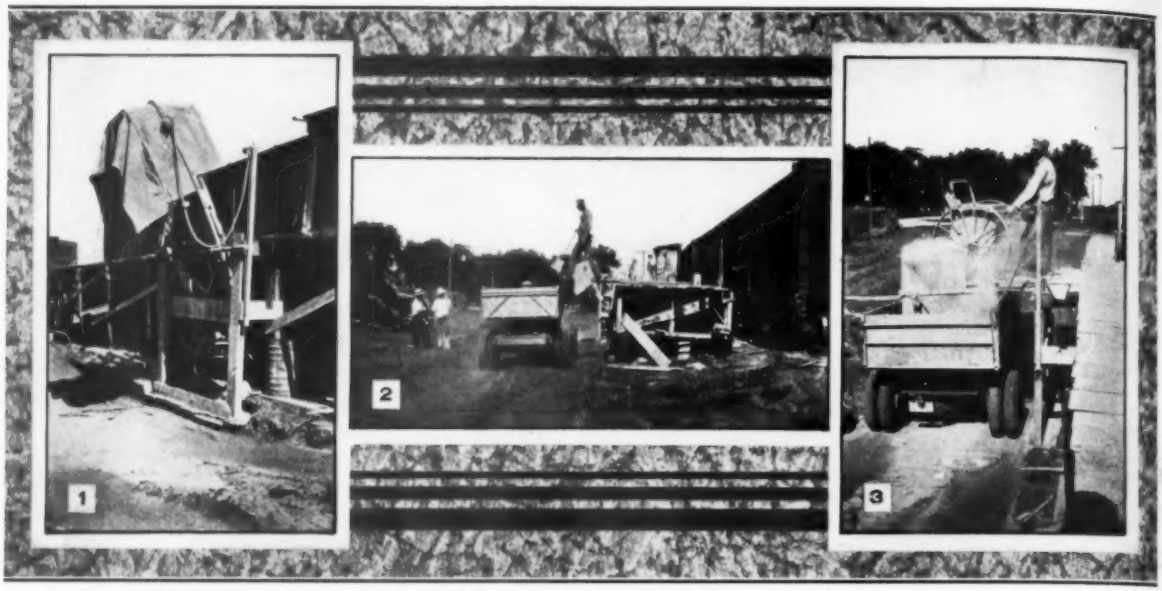
LOST time, such as paver breaks, failure of the batch trucks to deliver the materials, and failure of the water line, all contribute to the downfall of a high average of a paving outfit. On the 7-mile paving project from the O'Brien County line on the west and Highway 71 on the east and running through Everly, Iowa, G. G. Herrick of Des Moines kept down the lost time to the minimum so that he averaged 100 feet an hour for the twelve hours work five days a week, making the sixty hours per week work the State law allows in Iowa. There were weeks when the weather made shut-downs necessary and then the work extended into the sixth day. Good teamwork among a quiet-running group of men who were encouraged instead of driven made the continued high average a possibility.

Proportioning the Aggregate and Cement

The batching plant for the entire length of the job was located at the small town of Everly, Iowa, about 2 miles from the east end of the job. All aggregate was received in gondola cars from the Wallingford, Iowa, pit of the Concrete Materials Corp. of Waterloo, Iowa. On this job the State furnished the aggregate, both sand and gravel, and the contractor furnished the cement. Unloading was handled by a Northwest crane that first saw the light of day in 1923 and which handled the entire unloading burden without a hitch. It carried a 40-foot boom and swung a 1½-yard Blaw-Knox clamshell loading the Blaw-Knox bins for the batchers. The individual batches were composed of 1,696 pounds of gravel, 1,454 pounds of sand and 669 pounds of cement.

Instead of the customary dial to check the weights of the batches, the contractor used the usual beam scales and had a heavy nut on a hooked wire which was hung on the wrong side of the scale beam giving a light weight for the batch, then as that balanced the nut was removed and the scales again balanced. It required about 20 pounds of aggregate to bring the scale to even balance the second time and this amount was easily controlled with the gates of the bins. A Caterpillar Thirty was used to spot the cars for the crane. Between twelve and sixteen cars were unloaded each day at the batchers.

The bins were set up on the specified footing of 3 x 12-inch lumber 3 feet long and on top for the sill a pair of 16 x 16-inch timbers were used instead of the usual, and specified, 12 x 12-inch lumber. A novel scheme to put an end to the shouting at the batcher, telling the truck drivers to move forward or back to spot the trucks



A WELL-CONSTRUCTED AND WELL-OPERATED DOCK FOR HANDLING BULK CEMENT

1. A detail of the cement trap, showing the method of mounting and the counterbalanced beams beneath the platform. 2. Man stepping from the entrance end of the cement dock onto a truck to shovel sand against the tailgate in order to provide protection against the bulk cement sifting out through the cracks. 3. Dumping a batch of cement into a one-batch truck. Note the absence of cement scattering from the batch truck

right for the batchers, was used. A weight about 3 inches in diameter was hung at the proper distance from the front of the batchers so that the tailgates of the trucks should be spotted just beneath the weight to drop the batches right. As all the trucks were one-batch International, Ford or Chevrolet units, they were about the same length and one setting of the weight was sufficient for the entire fleet of twenty-four trucks that did the batch hauling by subcontract. All the trucks were equipped with dual pneumatics on the rear wheels.

The batching plant was enveloped in burlap at the top to prevent the blowing of the beam scales and to protect the batcher man from the sun. Depending on the point of view, one or the other was the more important. The operating crew at the batching plant consisted of two men in the aggregate cars, the crane operator, the batch man, and one man who operated the Thirty to spot the cars and who also picked the rags from the screens at the top of the bins. All hauling was done by Jess Harrington Contracting Co. of Mason City, Iowa, by subcontract as mentioned above.

The bulk cement dock had one particular feature that was worth special consideration. Instead of the counterbalanced trap that must rest on the trucks for support or be held up by the cable of the counterweight, the platform was built with long beams that extended under the cement dock so that when the trap was let down to dump the cement cart the beams came up under the dock and rested against the under part of the dock, giving ample support to the trap without any encumberances such as cables in front. The trap was built with 2 x 10-inch planks at the side and extended under the dock with the scrap iron counterweights hung on the end. Across the side timbers were 2 x 6-inch planks for the platform of the trap. Six-inch truck chassis frames were used as tracks on the traps to take the wear. The whole trap was hinged with U-bolts around a piece of cold-rolled shafting 2 inches in diameter. Running the Sterling carts onto the trap dropped it and running off let the weights lift it slowly. There was, however, a rope attached to the end to help start it as the lubrication was quite a problem in the presence of so much loose cement. The dumping hole was surrounded with galvanized iron and the trap was hung with canvas to prevent the spreading of the cement as dumped.

The cement dock, which accommodated two box cars at a time, was 84 feet long and 10 feet wide and was equipped with Fairbanks beam platform scales well protected by boxing the entire scales except the beams. There were two men in each of the two cars at the dock who loaded, weighed and dumped their own carts. One man at the entry end of the dock stepped aboard the trucks and covered the tailgates of the trucks before the cement was dumped, and another at the exit end stepped aboard and covered the cement with the sand.

GRADING AHEAD OF FORM SETTING

Grading on this project was started on July 7 and concreting on July 9, and the entire job completed on August 27, 1931. Ahead of all form setting the grade was cored out by a Stroud elevating grader which cast the material onto the shoulders. Following this a Caterpillar 12-foot blade pulled by a Sixty tractor cut the grade to the proper elevation and line. To cut high spots a Sidney 7-foot rotary scraper was pulled over the grade by the Sixty. An 8-foot Caterpillar maintainer was used to cut the final grade ahead of the forms and no teams were used on the job at any time. A foreman with twelve men, including all the machine operators, handled all the fine grade work.

The 10-inch Blaw-Knox forms were set before noon about 1,200 feet ahead of the paver, and in the afternoon the Lakewood subgrader was pulled over the entire length of the forms and a crew of the fine grade gang went back and hand-shoveled the windrows of earth

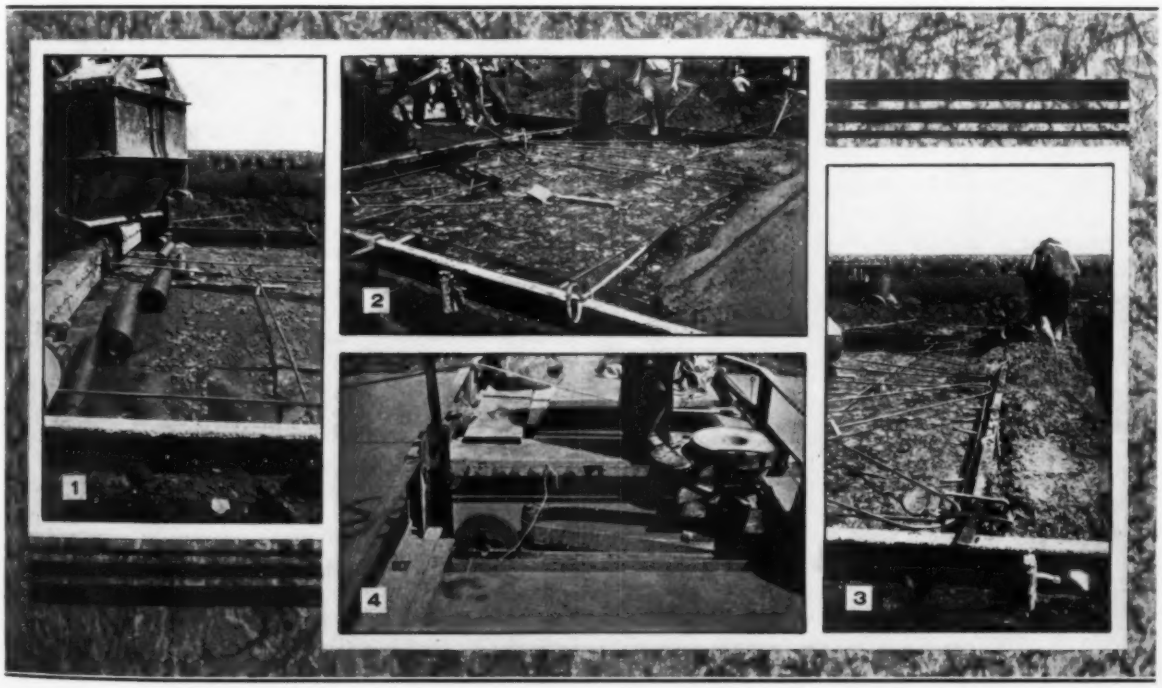
out to the shoulders. The entire grade, including the form line, was rolled with a Fordson with the wheels loaded with concrete. The form trench was cut by hand, and the forms were tamped ahead of the subgrader by the fine grade crew and again ahead of the paver by one man who also lined them up as required. The one-batch trucks were reversed on the grade by a Blaw-Knox turntable operated by one man. At the skip of the paver the spotter dumped the trucks.

POURING 100 FEET OF SLAB AN HOUR

On this job which was 18 feet wide and with a 10-7-10-inch cross section there were 42.755 cbuic yards of concrete per 100 linear feet without lip curb and 43.877 cubic yards where lip curb was run on both sides. Pouring 100 feet of slab an hour does not mean just taking it easy and maintaining that pace throughout the job. Because of the minute delays which cut production there must be many hours when the rate is 105 and even 110 feet per hour to make the average as high as 100 feet. The operator of the Koehring 27-E paver was careful in the spreading of the batches so that the loss of concrete over the forms was negligible. The paver pulled a Carr subgrade planer which cut the last ⅛-inch from the grade and left it true to the required contour. Some difficulty was experienced on this job at one point with the grade being too high at the paver. As the ground was dry and hard as rock it was necessary to wet it down thoroughly to soften it and then pull the paver back and cut it a second and even a third time with the planer. This was expensive and occurred for only a very short stretch until the subgrader was corrected and no further difficulty experienced. It is not customary to wet the grade in Iowa as the subgrade is protected with tar paper so that the concrete will lose practically no water through absorption by the grade. Two men shoveled the excess dirt from the subgrade planer to the shoulder. The steel was set by two men who placed the two center bars which ran continuously through the center of the slab 9 inches on either side of the center joint, the 11-foot transverse bars spaced every 3 feet and the single side bar on either side 9 inches from the forms. All bars were ⅝-inch, round, plain and placed 2½ inches fom the top of the slab, except the 2-foot dowels through the expansion joints which were placed at the mid-depth of the slab.

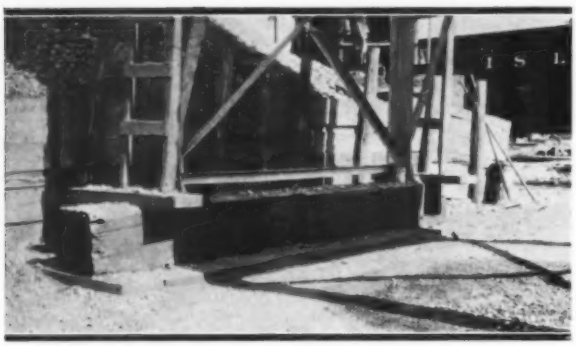
Two men made up the expansion joints of Servicized premoulded material with caps which remained in place after the bulkhead with which the joint was set was removed. The dowels through the joint had steel sleeves over the ends of the dowels away from the paver. In setting the expansion joint in the concrete it was trued up to a right angle with the forms with a wood triangle which was placed against the forms just as the joint was set. The ¾-inch expansion joints were set every 60 feet on this job.

The steel men placed the six rolls of 38-inch tar paper, which were unrolled by the steel men and the puddlers as the paver moved ahead and before any steel was placed. At the expansion joints eight hairpins made of the 11-foot transverse bars were placed, one at each outside corner of the slabs and one at each inside corner



SOME DETAILS CLOSE TO THE PAVER ON AN IOWA HIGHWAY PROJECT

1. Rows of tar paper immediately behind the paver covering the subgrade. Note the concrete scattered over the paper to prevent its blowing. 2. A detail showing reinforcing at an expansion joint and in the right foreground the method of supporting the 11-foot transverse reinforcing dowels. 3. Method of setting an expansion joint. Notice the U-shaped pins straddling the joint to support it and the handle at the end for lifting and placing the bulkhead. Eight "hairpins" as shown at the left of the joint are placed at each expansion joint under Iowa specifications. 4. The cutting wheel for the center strip and the center ribbon, the placing of which was attended to by the longitudinal float operators



One of the 16 x 16-Inch Foundation Timbers for the Batching Plant

formed by the center joint. Where they crossed any other piece of reinforcing they were tied with wire.

After the concrete was placed by the paver operator it was spread by the puddlers and spaded at the forms by two other men. The Ord finisher which followed up the puddlers carried drinking water for the entire crew, and cans of gas and oil to keep the machines well-supplied with fuel and lubricant. The finishing machine made two passes over the slab and on the second pass pulled the Heltzel Cleft-Plane machine with a cutter and coil of the prepared 2½-inch center strip or "ribbon." One of the men on the longitudinal float handled the placing of the center strip material and the other hand-floated over it.

During the pouring of the concrete the transverse bars were held at the proper elevation in the slab by steel pins with holes through which the bars were threaded. The pins were at the center, and at the edges the bars were held by wiring to the side bars. Midway they were supported temporarily by removable triangular plates with shoulders cut in them at the proper height. These had iron bar handles so that they could be pulled as the concrete flowed around and under the bars. The side bars were held at the proper elevation by removable strap iron supports.

The slab behind the finishing machine was carefully floated with a 12-foot longitudinal float by two men working from a double rolling bridge. These men were closely followed by the two finishers who first used the drag straight-edge, then the checking straight-edge, corrected any low spots with the 6-foot hand floats and then rechecked. These same men used the 10-inch canvas belts to give the final finish.

The four caps on the expansion joints were pulled and the joint edged by one man working from a bridge at some distance behind the finishers. This man with one other put on the 10-foot wide strips of burlap which were sprinkled for 24 hours. The burlap was carried forward the following day by a team and spotted for the men to spread.

The covering of the slab the following day with 2 inches of earth was subbed and fourteen men handled this and also pulled the forms, hauled them forward and sprinkled the earth cover for six days. The earth cover for curing was bladed off at the end of the curing period and used for making up the shoulders. To complete the shoulders where there was not enough earth supplied by the coring of the grade at the beginning of fine grade work, two draglines, one a Northwest and the other a Speeder, worked along in the ditches and cast to the shoulders. Two trucks also worked along with each dragline and carried extra earth back to make up low spots in the shoulder as needed.

The shoulders were trimmed to final grade and line with a Caterpillar Thirty and blade, a Warco maintainer and finally a Moritz shoulder machine was used in place of the other equipment.

Lip Curb on Grades and Curves

Lip curb 3 inches high and 12 inches wide is run on all grades of 2 per cent or more on both sides and on the inside of all super-elevated curves in Iowa to prevent the washing of the shoulders by the accumulation of running water. When lip curb was run on this job one finisher and a helper were used on each side. The concrete for the curb was shoveled out from the puddle by the spaders into pans made from old oil drums.

A Couple of Helpful Details

When the men on the rolling bridge were using the longitudinal float there was a certain amount of rolling motion back and forth as they swayed with the pulling of the float. Also on grades the bridge had a tendency to run away, so they kept four wedges on the float at all times, and as soon as it was moved ahead one man would insert two wedges on either side of the front wheel on his side and the other would put two wedges on the rear wheel on his side.

Messy paver skips are an abomination. If the cement adheres to the skip there begins an accumulation of material that slows up the speed of emptying the skip on each cycle. Scraping the skip now and then while it is on the ground is the usual way to prevent this accumulation becoming a nuisance. On the Herrick job another method was used which eliminated the need for scraping. A timber was mounted above the water tank on the paver. From this a bar was suspended with a spring holding it forward toward the paver skip. When the operator pulled on a cord from the bar it was pulled back and when he let go, the spring jerked the bar forward against the skip, giving it sufficient jar to loosen all the adhering cement. It worked very successfully and the skip was always free from any material that would slow up the flow into the mixing drum.

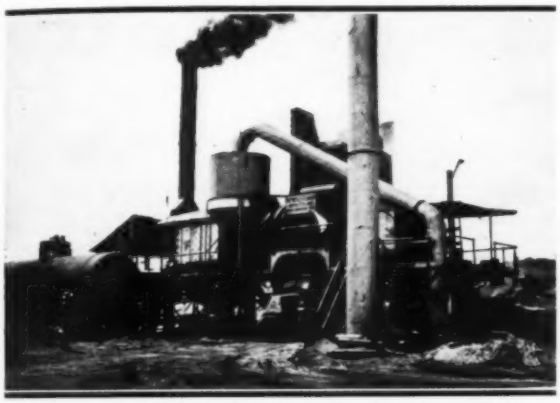
Water Supply

Water for paving and sprinkling was secured from the Ocheyedan River and pumped through a line of 2½-inch pipe by a C H & E No. 11 triplex pump with a duplicate as a standby. The last ¾ mile of pipe at the paver was 2 inches in diameter. Taps for the paver hose were set every 200 feet and two lines of 150 feet of 6-ply hose 1½ inches in diameter were carried by the paver. This eliminated any worry over a minute's delay in mixing time when the hose was being changed and there was no need of taking the entire crew of men from their various jobs to tear along the shoulder with the hose and thus break up the continuity of the work. Two or three grade men could easily handle the shift.

Personnel

E. J. Callahan was Superintendent for G. G. Herrick, of Des Moines, the contractor on this work, and P. T. Savage was the Resident Engineer for the Iowa State Highway Commission.

Asphalt Plant Layout *and* Machine Finishing Feature Alabama Paving



The Front of the Asphalt Plant Showing the Asphalt Tank Cars and One of the Trucks for Hauling the Hot Mix

The Wesco Company Completed 12.5-Mile Hot-Mix Job

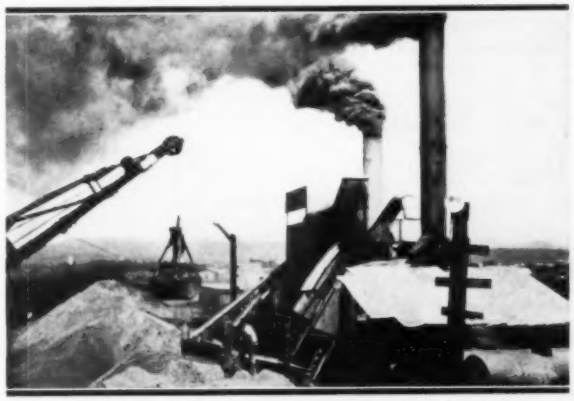
THE successful bidder on the 12.5-mile project starting at Huntsville, Alabama, on the Huntsville-Athens Highway, Route No. 72, was The Wesco Co., of Chattanooga, Tennessee. This project was part of the Federal Emergency Program and had a time limit expiring September 1, 1931. Work was started about May 8 and was finished four weeks within the time limit.

The pavement consisted of 3½ inches of binder base with 1½ inches of Alabama rock top course laid on a prepared natural gravel base. The pavement has an overall width of 20 feet. The old existing gravel road was in fair condition especially as to grade and width, but to insure a sufficient thickness of stone in the base approximately 6 inches of pit-run gravel was spread over the old road bed, compacted and shaped.

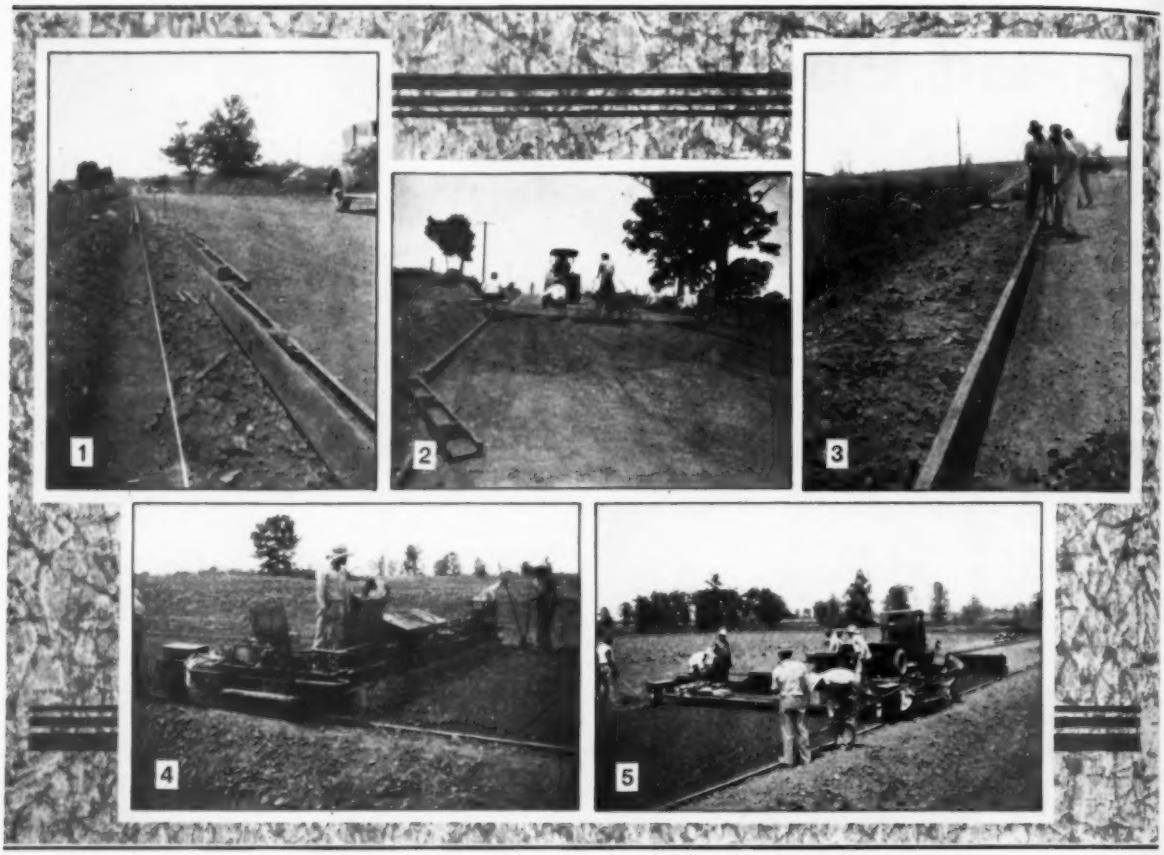
Form Setting and Preparation of the Grade

The subgrade was left by the grade crew approximately correct to within 0.1 foot. The form crew then set 8-inch Blaw-Knox steel forms to line and grade using the same method as for concrete work. The only exception was the sinking of the form 3 inches into the subgrade as no 5-inch forms were available. After the forms were set and staked, the subgrade was lightly scarified by the roller and a Lakewood subgrader was used to secure a true crown and grade. This was an economical method as the grade was extremely hard and carried a large per cent of gravel which made hand fine grading operations almost impossible. The excess dirt left in windrows by the subgrader was removed by hand labor.

After the grade was shaped by the subgrader and the excess dirt removed, it was sprinkled with water to keep the surface damp and to help compaction of the grade by the roller. The sprinkler consisted of a tank with sprinkler attachment mounted on a light truck chassis, and it did nothing but keep the grade wet throughout the entire day. This prevented an accumulation of dust from the trucks hauling asphalt. The form setting and subgrade operations were generally several thousand feet ahead of the asphalt gang.



The Back of the Asphalt Plant Showing the Aggregate Stockpiles



FORM SETTING AND FINISHING OPERATIONS ON THE BASE COURSE

1. Setting Blaw-Knox 8-inch steel forms 3 inches below grade. 2. A 3-wheel roller pulling a Lakewood subgrader over the lightly scarified grade. 3. The 6 x 5-inch trench for the bituminous curb and the curb gang placing and tamping the curb material. 4. The Ord finisher working on the base course. Note the roll of binder material carried by the front screed. 5. A rear view of the finishing machine showing the finished 3½-inch binder course before rolling.

The form and fine grade crew consisted of a foreman and an assistant, six men excavating form grade, four men setting and three lining up the forms, seven men on the fine grade and six men on the 1-foot shoulder and removing the forms. There was one man on the 3-wheel roller, one operator on the 2-ton Caterpillar tractor, one truck operator, two truck helpers moving forms and six men digging a trench for the bituminous curb. Six men were employed laying the bituminous header or curb and two extra men completed the crew.

ASPHALT CURB

Several hundred feet ahead of the asphalt gang, a crew of men excavated the trench for the 6 x 5-inch bituminous curb. This curb was constructed of binder material hand-tamped and was located just inside of the road form. In theory, it acted as a retainer for the 6 inches of gravel which had been applied to the old road surface. A small truck carrying several batches of the binder material kept the curb crew supplied with material which was placed and tamped by hand. A large steel dump plate was used and the material shoveled off the plate into the trench.

LAYING THE BINDER COURSE

A standard 20-foot Ord concrete finishing machine was used to spread and surface both the binder and top course. The only change made in the machine was the installation of two speed gears and an adjustable strike-off plate on the front screed. When screeding the binder, the front screed alone was used.

Two Galion spreader boxes were used to spread the material roughly on the base. Each spreader box was handled by two men. The truck with the batches backed up to the box which was hooked on to the rear of the truck. As the material flowed from the truck to the box, the truck moved ahead while the spreading was controlled by the two laborers. Just as fast as the material was spread full width on the base, the finishing machine advanced, striking off the binder to a true crown and grade. One man watched the distribution of the material in front of the Ord finisher while two laborers with rakes dressed the edge of the binder course adjacent to the forms and two more laborers hand-tamped along the inside of the forms. This was necessary as the power rollers had a tendency to shove the forms out of alignment when rolling too close to them. The binder was then rolled with two tandem gas rollers. The resulting binder surface was very uniform as to texture, crown and grade.

The Wesco Co. laid out its work so that it was a matter of daily routine, and seldom changed. Top would be laid at the beginning of the day, and the

plant switched to binder just as soon as all binder laid the preceding day was covered. This generally averaged around 1,400 linear feet of roadway per day.

In the laying of pavement, there were four men on the spreader boxes, one shoveler in front of the finisher, one operator for the Ord finishing machine, two hand tampers and two rakers.

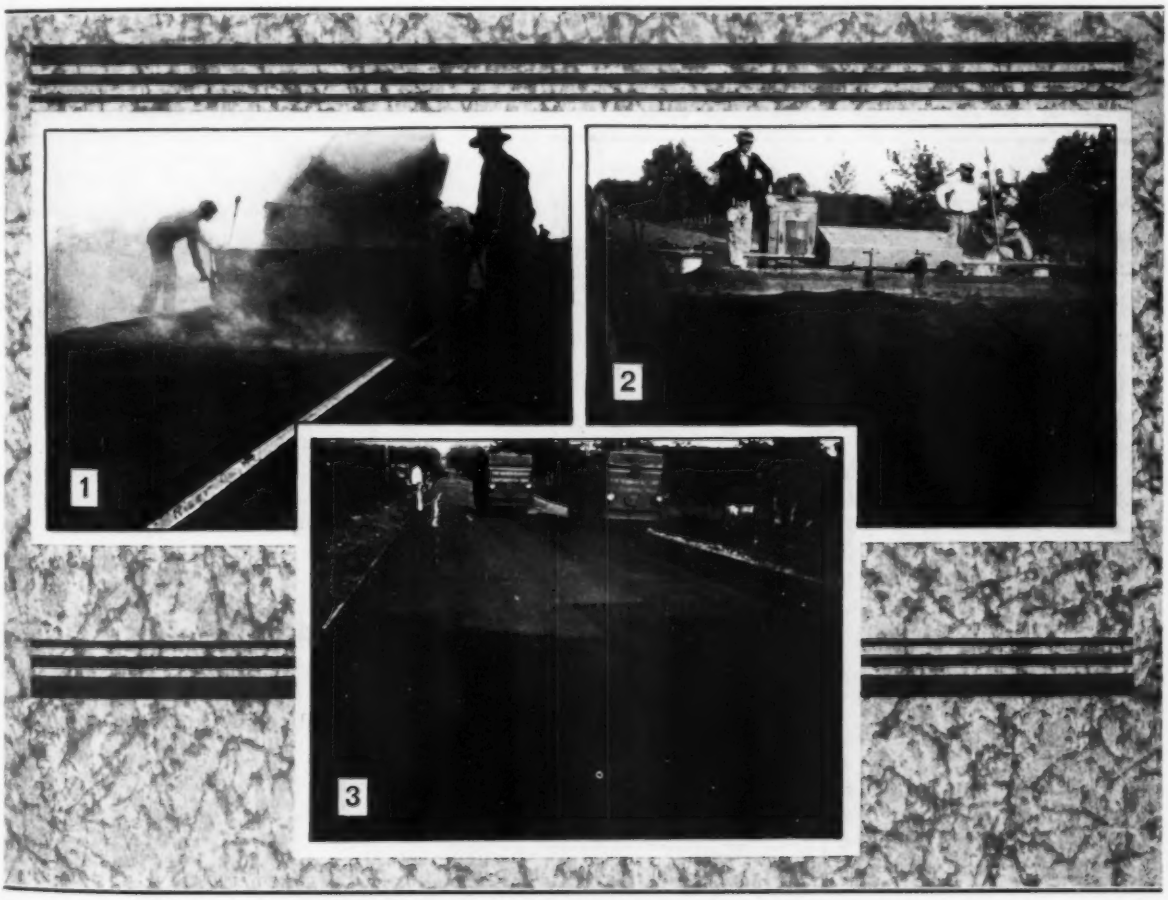
LAYING THE TOP COURSE

To secure the necessary excess depth for compacting the top course, a set of risers in the form of U caps to fit over the top of the standard road rail was made. These were 12 feet long and made up of 2¾ x 1½-inch angle irons and a ½-inch flat strip held together by a ½-inch rivet. When laying top course the Ord finisher was run on these caps which were continually moved ahead. The material for the top course was finished in the same maner as concrete would be, namely, with two screeds. The front screed was set slightly higher than the rear screed. This variation fed the rear screed continuously, allowing it to fill any depression left by the front screed, or to correct any high spots by reducing them. The top course material was handled in the same manner as the binder through the use of two spreader boxes and the same crew of men who handled the binder.

Continual checking of the surface by a man with a 10-foot straight-edge eliminated practically all roller distortion and gave the roller operators something to check on while rolling. Two men hand-tamped along the forms immediately behind the finisher, while two laborers with rakes corrected any faults left in the surface by the finisher. The "back surface" crew consisted of one raker and a helper. When the rollers were unable to eliminate any variation in the top surface, it was immediately corrected by these men. Consequently very little correction by surface heating had to be done the following day. The first load of hot-mix material went on the job at 6:15 A. M. and generally by 10:00 A. M. all top was laid and a switch to binder was made. An average of 1,200 to 1,400 linear feet of top was laid per day.

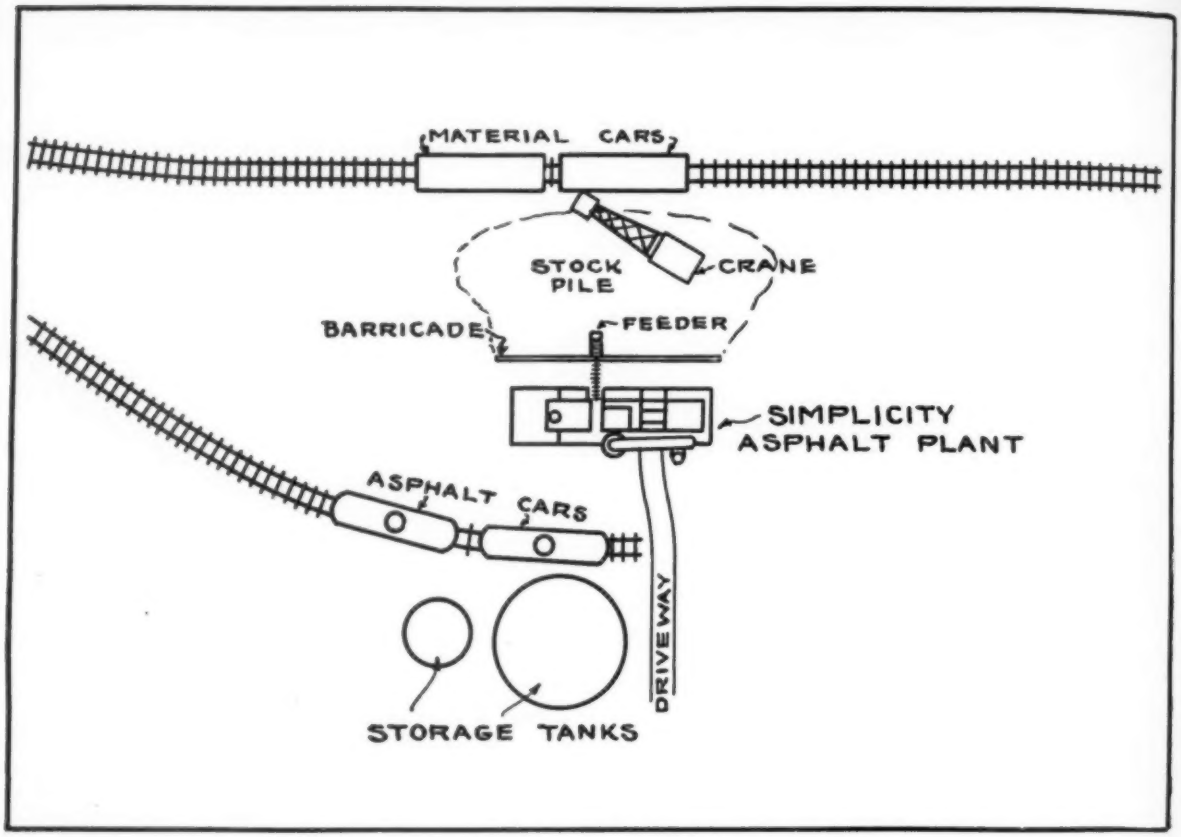
On the back surface there were two men straight-edging and doing correction raking, two men on the tandem rollers and one on the 3-wheel roller as well as one man attending the Hot Wagon.

The binder course batches consisted of 1,210 pounds of slag, 700 pounds of sand and 4.5 per cent asphalt, and was produced at a temperature of 350 degrees. The top course batches were composed of 20 per cent sand addition, 75 per cent Alabama rock, and 5 per cent asphalt mixed and heated to a temperature of 350



SPREADING AND FINISHING THE TOP COURSE

1. Laying down the top course with a Galion spreader box. Note the riser cap on top of the road rail to give an excess of material to take care of roller compression. 2. The Ord finisher screeding the Alabama rock top course. 3. Two tandem rollers compacting the top course. Note the laborer with a straight-edge at the left. By continual checking in this manner during rolling, a remarkably smooth riding surface was obtained



Layout of the Asphalt Plant on the Wesco Job at Huntsville, Ala.

degrees. The slag was furnished by the Birmingham Slag Co., and the Alabama rock furnished by Alabama Rock Asphalt Co., Inc.

The Asphalt Plant

The total amount of hot mix required on this project was approximately 39,000 tons. Since the contract amounting to about $500,000 was awarded on March 26, 1931, and the first load of asphalt was laid on the street on May 6, 1931 and the specifications called for the completion of the highway on September 1, it was necessary for the contractor to produce an average of 400 tons of asphalt per day from the beginning of the project until its completion. A Simplicity asphalt plant which was just entering its sixth year of almost continuous operation was installed by the Wesco Co., and completed the project on August 6. Owing to weather conditions and other delays the plant actually operated only 69 days and produced an average of 565 tons for every day it operated. The largest single day's run was 988 tons.

The asphalt plant was set up on a railroad siding, with aggregate and asphalt spotted as shown in the accompanying diagram and photographs. The aggregate was unloaded from the cars by a P & H crane with a Blaw-Knox 1-yard clamshell bucket and piled to a height of from 25 to 30 feet over the slow moving crawler type Simplicity feeder. This uniform feeding of materials to the cold material elevator maintained a practically constant temperature of the material and a uniform grading of the aggregate. The materials were dried and heated within the double shell dryer measuring only 9 feet 6 inches long but which, owing to its insulated double shell design, was capable of producing all of the material which could be properly mixed in the 1-ton pug-mill mixer.

Personnel

Trucking on this job was done by J. C. Byram & Co., of Birmingham, Ala., who maintained an excellent schedule, which meant very little lost time waiting for trucks. The dead haul consisted of approximately ½ mile with a maximum live haul of about 11 miles. For the Wesco Co., T. O. Early was Chief Chemist, J. M. Rubin was Superintendent in charge, with W. C. Burton as Plant Foreman and W. E. Alley, as Road Foreman. A. L. Wallace was Resident Engineer for the State Highway Department.

Shadows of Coming Events

Particularly interesting articles describing jobs which were visited by the Editor during his 8,000 miles of travel this past summer and which will appear in early issues are "It's a Race Between the Paver and Cement Dock," "Paving 4.5 Miles with Experimental Sections," "Paving by Subcontract and Some Interesting Details," "Grading 5 Miles of Road in Iowa" and many others. They will be interesting and helpful.

Watch for Them!

Batch Hauling

With Industrial Railway

on a 16-Mile Project

OUTSTANDING problems on the Powers-Thompson Construction Co., contracts north and east of Plainfield, Ill., this past summer were the large amount of rock in the subgrade which slowed up the preparation of the grade, and the method of handling the two aggregates and the cement to prevent the sand or cement sticking to the bottoms of the batch boxes. The grading problem was solved by slightly heavier equipment and the use of local teams and additional fresnos when the grade was found high by the fine grade crew. The handling of the batches which had proved a troublesome affair was solved in the most simple manner. At the start the gravel was placed in the batch boxes first and then the train run forward to the cement dock and the six bags of cement dumped into the boxes on top of the gravel. Then to prevent the cement blowing and to complete the batch, the sand was placed on top. This was ideal as far as preventing the cement from blowing off the batch, but it was found that the cement worked down through the gravel during the long haul over the rough track to the paver and tended to stick to the bottom of the box when it was dumped at the paver. This difficulty was overcome by reversing the order of the aggregates and placing the sand on the bottom and the gravel on top of the cement. This had an additional benefit

A Long Line of Center Strip Laid Ahead of the Rex 27-E Paver. This Was Possible Because of the Use of an Industrial Railway for Batch Hauling.

Powers-Thompson Construction Co. Built Two 8-Mile Sections One on Route 66 and Another on Route 53 in Illinois Last Summer

because the gravel hit the skip first and tended to clean it on each delivery to the paver drum.

THE LARGE BATCHING PLANT

An aggregate bin capable of holding three cars of aggregate was erected over the industrial railway track and equipped with eight Johnson batchers. There were four for gravel and the same number for sand in two groups. The 12-car trains with two boxes to a car pulled into a switch on the road near the plant and exchanged for a full train. The yard locomotive there picked up the empty train and pulled by the cement platform to the batching plant. The locomotive engineer deserves considerable credit for the remarkably accurate manner in which he spotted the cars under the batchers without the aid of a brakeman. He had lines of rivets, fence posts and other objects spotted on the track which gave him the correct place to hold the locomotive for each pair of cars to be loaded. This greatly speeded the loading at the plant. The heavy bins were supported by typical gantry frames which gave sufficient clearance within the structure and placed the truss bracing on the outside.

Upon receiving the full load of sand the train pulled forward and stopped at the long cement platform for the six bags of cement per box. The cement dock was built sufficiently long to accommodate two cars of cement which was shipped in bags. Four men under contract handled the cement from the two cars. They used hand trucks to bring out six bags of cement per load and then spotted the piles along the dock edge ready for the train. Each man as he emptied the bags into the boxes tossed the empty bag over the edge of the box so that at any time the actual number of bags that had been emptied could be checked. As soon as the sixth bag had been emptied into any one batch box, the six bags were tossed off to the far side together and then picked up by another man and baled. The train then backed to the bins again and received the load of gravel. The individual batches consisted of: 2,160 pounds of gravel, 1,230 pounds of sand and the six bags of Universal cement.

The sand and gravel were shipped in from the local pit of the Chicago Sand & Gravel Co., at Plainfield in gondola cars and unloaded by a Northwest crane with a 42-foot boom and a Williams 1½-yard clamshell bucket. A large stockpile was maintained in spite of the proximity of the producer's pit. There were two men in the cars to clean up and spot the bucket, a crane operator and two batch men. One of the batch men cleaned the track after each train had pulled out to be sure that no gravel had fallen on the track which might cause a derail where it would be very difficult to get the cars back onto the track. There was one yard locomotive and five hauling trains. One of these, however, acted as a booster on the grade where there were only four trains working. There were two 6-ton and 8-ton Whitcomb locomotives on the work. Five men were used to maintain the track. Switches were set every 1,000 feet.

PREPARATION OF THE FINE GRADE

The rough grading was so well taken care of that except in one instance the fine grading ahead of the forms consisted of the use of but two teams and fresnos to take off the high spots. In the one instance where there was trouble and the paver was creeping up on the fine grade crew, several extra teams and fresnos were put in and in one-half day the fine grade crew was out of trouble and the paver was no longer "on their tails." If there is anything that causes a fine grade foreman to get uneasy and to wax wrathful, it is to see the paver crawling ruthlessly forward until it is within 100 feet of his men. He then usually begins to plead with the superintendent for an extra number of men or teams and joyfully pulls himself out as quickly as possible.

The Truscon 9-inch forms were set ahead by two form setters and two helpers after the Ted Carr Formgrader had cut the trench in the hard stoney soil. The forms were set as far as 1,000 feet ahead of the paver and the center steel as much as 500 feet ahead if there was no expansion joint to bother the men. On this contract the new method of setting the expansion joints was used. After some experience with numerous breaks in the pavement during hot weather, four years ago 4-inch expansion joints at approximately 1,000-foot intervals and also at PT and PC and at the tops of vertical curves were specified. Further reinforcing of the slab adjacent to the expansion joints was undertaken in 1931 to prevent the shattering that occurred so frequently throughout the State. The standard cross section of pavement slab on this job was 9-7-9-inch with the slab 9 inches thick for the outer foot and then reducing in thickness to 7 inches in the next 2 feet. The 7-inch thickness was maintained for the center 14 feet. In reinforcing the expansion joints the grade had to be changed considerably in the vicinity of the joint. All this work was done by hand labor. For a distance of 3 feet parallel to the center line of the road the slab was made 9 inches thick and then reduced to 7 inches in the next 3 feet. The pavement slab was thickened on both sides of the expansion joint to give additional cross bending strength to the pavement, as there is naturally a weak spot at that point and there is no way of carrying the load from one section of the pavement to the other. Each expansion joint in Illinois is 4 inches wide and extends the entire width and depth of the pavement.

On the Powers-Thompson contract the expansion boards were tapered slightly to make the removal easier. They were 3¼ inches thick at the bottom and

4¼ inches thick at the top and sheathed with sheet metal which was oiled before placing in the slab to prevent adherence to the concrete. The boards were in two sections each 10 feet long and one section had eyelets in it to facilitate removal. As soon as one section was out the other could be lifted with a pick under the center.

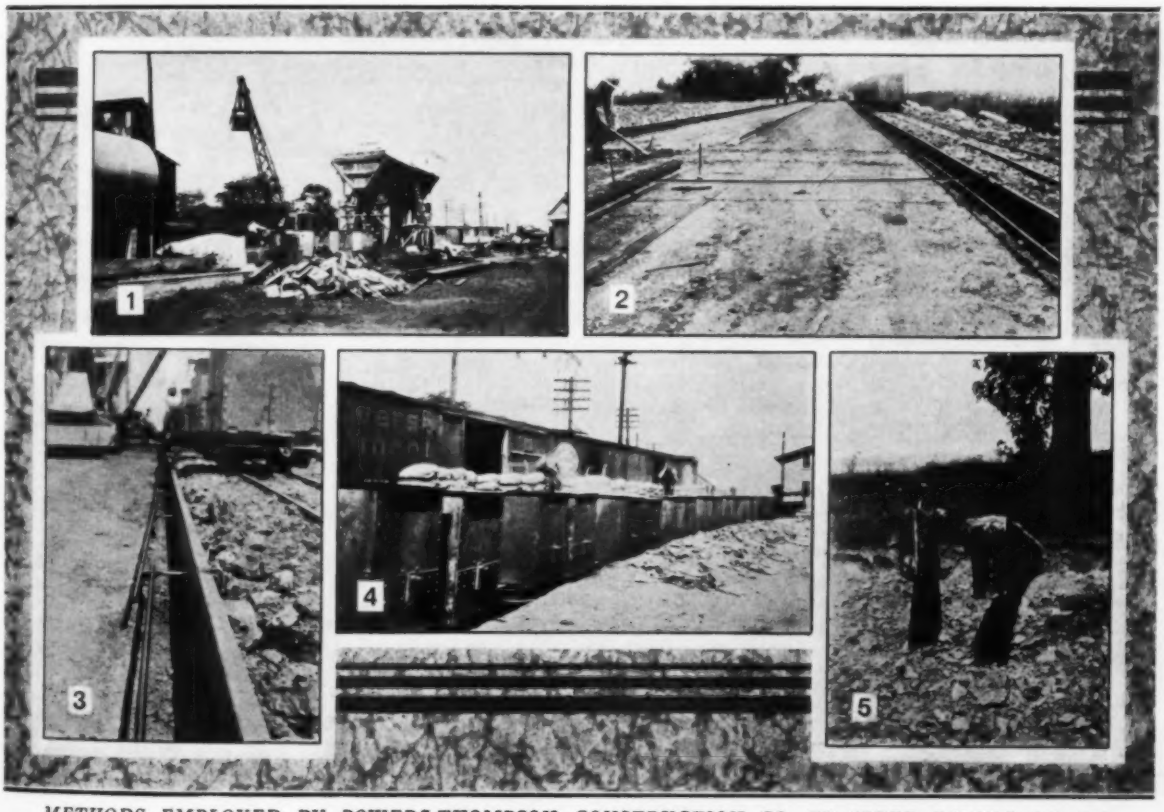
After the forms had been set a Lakewood subgrader was pulled over the grade while resting on the forms by a small tractor. Three or four men were employed to shovel out the windrows of dirt from behind the subgrader. The side trench from the forms was cut and the grade generally trimmed ahead of the subgrader with a Wehr one-man power grader. The grade was uniformly rolled ahead of the setting of the center steel by an Austin Pup 5-ton roller. The center steel man who kept the steel set fully 400 feet ahead of the paver also set and oiled the marginal bars of ⅞-inch rods 21 feet long and lapped one foot at the end with a space of 1 inch between the bars. They were set in stamped metal chairs 4½ inches above the grade and 6 inches from the forms on both sides of the road.

In setting the center strips for the longitudinal plane of weakness the setter used a spacer from the forms to insure the accuracy of the placing in the center of the slab. It consisted of a 1-inch angle iron 10 feet long with straps to hold the center steel and to hold the spacer at the forms.

At the Paver

The batch boxes were unloaded from the cars by three men and dumped directly into the skip of the Rex 27-E paver, while one man operated the hoist on the paver for the boxes. There was an operator on the paver and also, because this was in the vicinity of Chicago and hence a union job, a helper who performed a few duties around the paver. The paver did not pull a subgrade planer but two fine grade men pulled a scratch template to check the grade. These two men corrected the grade as necessary at the paver according to the indications of the scratch template. It was remarkable how little work there was to do because of the accuracy of the work of the fine grade crew and the fact that the grade was not cut up by trucks. One of the template men sprinkled the grade at the paver.

There were three puddlers who also did the spading around the forms. The machine finishing was done by an Ord machine with one operator. Two finishers did all the work from the longitudinal float back to the edging. The longitudinal float was 10 feet long and was pulled from a double rolling bridge with the passes lapping one-half each time. Following the float they used the checking straight-edge, then the long handled 5-foot floats if there were low spots that had to be filled and refloated, the 8-inch belt and finally did the edging of the slab on both sides.



METHODS EMPLOYED BY POWERS-THOMPSON CONSTRUCTION CO. TO SPEED PAVING ON ITS 16-MILE PROJECT IN NORTHEASTERN ILLINOIS LAST SUMMER

1. The large aggregate bin equipped with eight Johnson batchers. 2. Cutting an expansion joint trench. In the foreground is seen one of the light weight structural steel spacers for setting the center steel. 3. Methods of lapping the ⅞-inch marginal bars. 4. Emptying the six bags of cement per batch box on the sand before loading the gravel aggregate. 5. A pair of tapered expansion boards sheathed with sheet metal and oiled to prevent sticking to the concrete.

The burlap for the initial curing was spread from a rolling bridge by two men who also sprinkled it and the following day removed it and spread the grade with Columbia calcium chloride, using a wheeled hand spreader and then a squeegee to complete the spreading if there were any lumps.

Two men from the fine grade crew were sent back each morning to pull the forms from the previous day's run. This work was completed in the morning when the men were free to return to reinforce the fine grade crew. The forms were hauled ahead by a truck running along the wide shoulders.

Steam Pump for Water Supply

A Worthington reciprocating steam pump such as is used for boiler feed work was used to supply the water for the paver and sprinkling. Two vertical steam boilers located alongside the pump on the bank of the stream were used alternately to supply the steam. A union engineer was in attendance. Both 2½-inch and 2-inch pipes were used for the supply line, the latter close to the paver. The taps for the connections of the paver hose were placed 200 feet apart in the line. The paver carried 200 feet of 1½-inch hose equipped with Quick-as-Wink couplings which eliminated all delays in making the connection to the new tap. At the paver end of the hose there was a double lug coupling making it easy to disconnect the hose at that end also. This was done because the paver hose was used at night to sprinkle the grade so that it would be dustless and generally damp for the paver in the morning.

The Gasoline Supply

Gasoline for all the equipment was supplied by the National Refining Co., through its local distributing station. A tank truck drove out on the grade once a day and filled all tanks. A 50-gallon drum of gasoline was carried on the paver as emergency storage in case any piece of equipment was missed in the daily round.

Personnel

This contract was completed by the Powers-Thompson Construction Co., Joliet, Ill., with W. G. Dooley as Superintendent. C. F. Bergquist was Resident Engineer for the Illinois Division of Highways.

Safety and Material Hoists

AS the result of an intensive study of the best systems in use by contractors in the principal cities of the United States, the Building Trades Employers Association of the City of New York through its Accident Prevention Committee has recently issued a bulletin containing safety suggestions for the protection of workmen on material platform hoists. The task of preparing this bulletin, which is No. 12 in the series of safety pamphlets compiled and published by the Association, occupied a period of approximately three years and the value of the committee's labors is greatly enhanced by sixteen actual photographs taken on jobs showing the most approved methods for preventing casualties.

The seriousness of the material hoist situation was evident as far back as 1927 when figures compiled by the Bureau of Statistics and Information, Department of Labor, State of New York, showed that for the fiscal year ending June 30 the cost of 90 compensable construction hoist and elevator injuries in the State amounted to $108,838. For the year ending June 30, 1929, the number of cases had decreased to 78, but the cost had risen to $111,876. For the three-year period ending June 30, 1929, the cases totaled 249, costing $315,946.

The principal causes of injury were the breaking or unwinding of the car cable, machinery breaking, caught by the cable, caught in or struck by machinery, struck by a car, sudden start or stop of car, caught between the car and the floor, shaft or overhead equipment; falls of workmen into shafts from the floor, car or other point, falling objects having their source from the floor or the car, fall of the car and other hazards.

In a foreword the committee states that the purpose of its recommendations is to provide reasonable safety for life and limb and to be useful to contractors in expediting plans for safe practices which will save them time and money in eliminating needless accidents. While admitting that no "hard-and-fast" rule will decrease material hoist accidents the committee feels that a greater degree of safety can be accomplished by careful planning and constant attention to details not only by the operating executive who must strive for the cooperation of the workmen, but by the various contractors on the job. Operating executives should see that their field man understand their responsibility for hoist accidents and know what may be done to prevent such occurrences as the character of the work will permit. Contractors responsible for the operation of hoists should not only provide the means for their safeguarding, but also make allowances for their maintenance.

The safety suggestions include those for the design and installation of equipment, the protection of workmen, guarding material hoist shaftways, signaling systems, signals for hoists, housekeeping and hoist control. One of the interesting features of the Bulletin is the Fourteen Points for the Instruction of Workmen. They are as follows and sum up in brief the principal causes which lead to accidents:

1. Never ride on a material hoist.
2. When loading or unloading, keep off the platform, if possible.
3. Never stick your head into a hoist shaftway to locate the car. A hoist is dropped too fast to dodge it. Learn to look for the cables to see if it is operating.
4. Never leave anything projecting into the shaftway. If working in an adjoining shaftway do not stick your arms or feet into a shaftway where a hoist is being operated.
5. Never throw anything down a shaftway.
6. Do not pile material or place tools near the edge of a shaftway where they may fall on men below.
7. Never climb the barricade. Use a ladder.
8. Never remove a guardrail without authorization—then be sure to replace it.
9. Keep away from hoisting engines and cables.
10. Treat all electric wires as live wires. Do not touch them.
11. Never run, scuffle or practice horseplay near a shaftway.
12. Pay attention to danger signs.
13. Never give signals to the engineer until you are familiar with the work, and then only when you are authorized to do so.
14. Report unsafe conditions to the foreman at once.

Copies of this Bulletin No. 12 are available to readers of CONTRACTORS AND ENGINEERS MONTHLY by writing to the Committee on Accident Prevention, Building Trades Employers Association, 2 Park Avenue, New York City.

Equipment Ownership Expense

THIS pamphlet which is a report on the cost of owning and maintaining construction equipment, including a schedule of items and suggestions pertaining to accounting and rental, has been prepared and published by the Associated General Contractors of America and contains considerable valuable information. More than 700 items of construction equipment are listed in the schedule and for each one the expense per working month is shown in percentage, so that the schedule is applicable to specific prices. This publication is the result of considerable research and is intended to form a scientific basis of computing equipment charges in connection with bid preparation, cost plus work, and as a practical guide in making inventories, ascertaining depreciation, filling out income tax reports and in general accounting.

Copies of this document are available to others than members of the A. G. C., the price being $1.00 for a single copy, $10.00 per dozen and $50.00 for lots of 100 or more. Requests should be addressed to the Associated General Contractors of America, Inc., Munsey Bldg., Washington, D. C.

Building *an* Airport *among the* Hills

Allegheny County Builds New Field with Bituminous Macadam Runways Within 10 Miles of Pittsburgh

Drainage Ditch in Hard Shale 16 Feet Deep Dug by Hand During the Winter. Note the Windbreaks Which Made Work Possible.

FOLLOWING one of the largest excavation jobs in present day airport construction, involving the handling of 2,000,000 cubic yards of earth and lime rock, the Department of Public Works of Allegheny County, in which Pittsburgh, Pa., is located, has pushed the construction of its bituminous macadam runways so that early in September, six runways, each 500 feet wide, were opened. The main east and west runway is 3,800 feet long and the intersecting runways from 800 to 1,200 feet long. The Municipal or County Airport is located about 10 miles from the heart of Pittsburgh at an elevation of 1,250 feet, which is higher than any surrounding terrain within ¾ mile, and is reached by well-paved roads.

Winter Construction

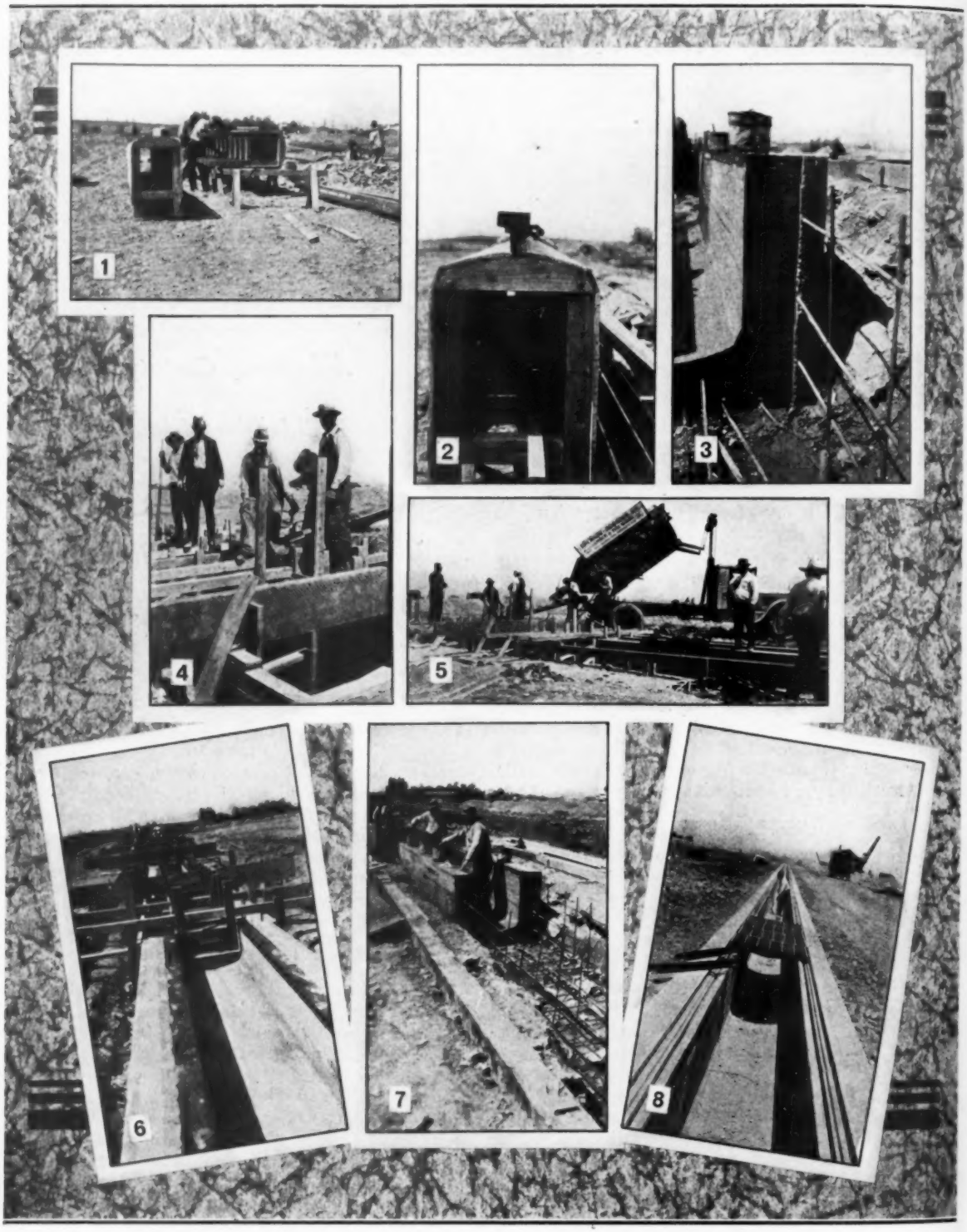
In order to hasten the completion of the airport and also to aid in solving the unemployment situation in the County, the Department of Public Works started the construction of drains in the roughly graded ground last winter. The original field grading was done by the Vang Construction Co. of Pittsburgh by contract under the direction of the airport engineer.

The regular maintenance equipment for the County was employed on the work, leaving only such equipment and men at Road Division Headquarters as were required for emergency maintenance during the winter and spring. The regular county force was augmented to an average of 300 men at the airport. The excessive winds and storms at elevation 1,250, the field level of the airport, made winter work very difficult. It was necessary to erect windbreaks in 8 x 12-foot sections which were placed in groups about salamanders. Behind these windbreaks, hand labor was able to dig the trenches. The men were given coffee every two hours and work progressed more rapidly as the men dug into the trenches and were thus protected from wind and weather. An 18-inch frost saved shoring where the trenches were as deep as 15 feet.

Drainage

Drainage of the airport was handled by ditches run on the edges of the cross runways, carrying 12-inch perforated corrugated metal pipe at depths from 18 inches to 15 feet. Similar ditches were also constructed on the southerly side and easterly side of the east and west runway, bordering a grass plot. Slag from 4 to 6 inches was used to fill over the pipe to grade and in such areas where it might constitute a hazard, it was covered with premixed tar and stone ⅝ to ¾-inch in size and rolled lightly.

Concrete drains for receiving the water from the runway surface were constructed leading to the underground sewer system. These were installed with invert grades of 1 per cent, making variable heights for the sides of the drains necessary to maintain the top surface at field level and the invert at the proper 1 per cent grade. Collapsible forms were built in units of 200 feet and in sections 15 feet long to permit reuse in different parts of the field where the invert depths were similar. This saved considerable expense in the use of lumber for forms, speeded up the installation and proved very economical. The type of form is shown in detail in the illustration. The 15-foot sections were poured with separate bulkheads and poured alternately. Reinforcing of ½-inch deformed bars was carried continuously, spaced 6 inches apart longitudinally and 12 inches vertically. Under the invert two courses of reinforcing were carried in the 12-inch slabs. The side walls which also were 12 inches thick carried reinforcing 2 inches from the outside or back of the walls. The concrete for all of this work was purchased



PREPARING THE DRAINAGE SYSTEM FOR THE ALLEGHENY COUNTY AIRPORT

1. Building the variable depth forms alongside the trench. 2. One of the wooden T's which were cast into the channel walls to form the slot for the side bars and gratings. 3. A section of side wall with the T still in place. 4. Pouring the side wall of a drain. 5. Ready-mixed concrete truck delivering concrete for a drain. 6. A complete drain with low side walls in the foreground with the adjacent section ready to pour. 7. Rubbing down a section of drain with cement and water after the initial set. 8. One of the completed drains showing a pair of malleable iron T's ready to be inserted in the slot and several sections of grating in place. These form a smooth surface flush with the field so that planes can run over them safely.

from three ready-mixed concrete companies in the county.

In order to get a good finish with plenty of rich cement grout against the bottom of the invert, pea gravel concrete was used for the bottom course, wet enough to flow freely. This was well compacted and spaded by hand. In order to prevent the inside form from moving out of line, care was taken that when pouring side walls of a depth greater than 2 feet, the concrete was poured at the same time from two transit mixers, one on each side of the drain. The forms were removed in 24 hours and the invert and wall rubbed with cement and water to a smooth finish.

The top of the drain is a malleable cast iron grating carried flush with the top of the drain at field elevation. In order to furnish a satisfactory support for the grating 2 x 4's were laid along the top of the forms during pouring to give a notch 2 inches high by 4 inches wide. To insure a metal-to-metal bearing, a malleable iron T in 30-inch sections was laid in the concrete below the notch formed by the 2 x 4's. In order to furnish the space for this malleable iron T, a well-oiled wood T pattern was nailed to the bottom of the 2 x 4, as shown in one of the illustrations.

For the illumination of various parts of the field, six parkway cables were suspended by galvanized hooks carried in the walls of the concrete drains. A 9-way underground conduit carried the cables across the field with three manholes in each runway crossing.

Grading for Runways

All sections of the field were left at reasonable grade by the grading contractor, but some sections where large pieces of limestone occurred necessitated reblasting and hand sledging before the blade graders hauled by tractors and the bulldozers could blade the surface to final grade. The finished subgrade was then rolled with 18-ton steam and gas rollers to the grade of the field.

Following the preparation of the subgrade No. 18 slag, being the run of the crusher passing through a 4-inch screen, was spread from trucks with the tail gates partly open, as a base course, bladed, bulldozed to approximate grade and rolled with an 18-ton, 3-wheel, roller. The slag used was from a dolomite limestone and weighed about 2,500 pounds per cubic yard.

Next, the No. 23 slag, running from 1½ to 2½-inch screen size, was spotted in piles by the truck and left in piles until just before it was time for application of the tar. This was done because of the frequent rain, as it was found that both the subgrade and the slag dried quicker when the latter was left in piles than when it was spread on the runway. The bulldozer, as illustrated, was used to break down the piles immediately before application of the tar. Prior to the application, however, the slag was rolled with 10 and 12-ton steam and gas rollers.

Applying the Tar

The rolled No. 23 slag was penetrated with 1¼ gallons of tar per square yard at 225 degrees Fahrenheit. The Tarmac was delivered to a siding in tank cars by Koppers Products Co., Pittsburgh, Pa., and applied to the slag by two Hvass and two Etnyre pressure distributors, owned by Koppers.

Key stone slag of 1-inch maximum screen size was then applied by a Big Sandy at the rate of about 40 pounds per square yard and the runway immediately rolled with 10-ton tandem rollers. To insure a uniform surface and to maintain the 0.5 per cent grade from the center of the runways to the sides, a leveler 50 feet wide was developed. This leveler had channels built into the center 30 feet against the two 3 x 8's which were used as a base. The whole was supported by a truss top and tie rods running diagonally from the base to the 12 x 12's, each about 12 feet long, and each of which carried two double rollers at each end. This leveler insured a uniform grade and resulted in a remarkably smooth surface. Then a seal coat of ½-gallon per square yard was applied by the distributor and fines of ½-inch screen size applied and rolled.

The No. 46 slag, or key stone, was stockpiled during the latter part of the winter at the airport and piled to heights as great as 25 feet by bulldozers and then, as needed in the work during the spring and early summer, was rehandled by two clamshells on truck-mounted cranes and hauled to the Big Sandy by trucks. The novel ramp illustrated was used to permit the trucks to back up and dump directly into the Big Sandy distributor.

Some soft spots were found in the subgrade after the application of the 4-inch slag base course. These showed by a slight waving under the rollers and under the rear wheels of the Big Sandy. During the summer when the sun was particularly hot and these spots had dried out considerably, an 18-ton, 3-wheel roller was run over the finished runways to give a final consolidation, while the tar was slightly plastic because of the heat of the sun. This was followed immediately by rolling with 10 and 12-ton tandem rollers to take out the wheel marks of the heavier machine.

Schedule of Operations

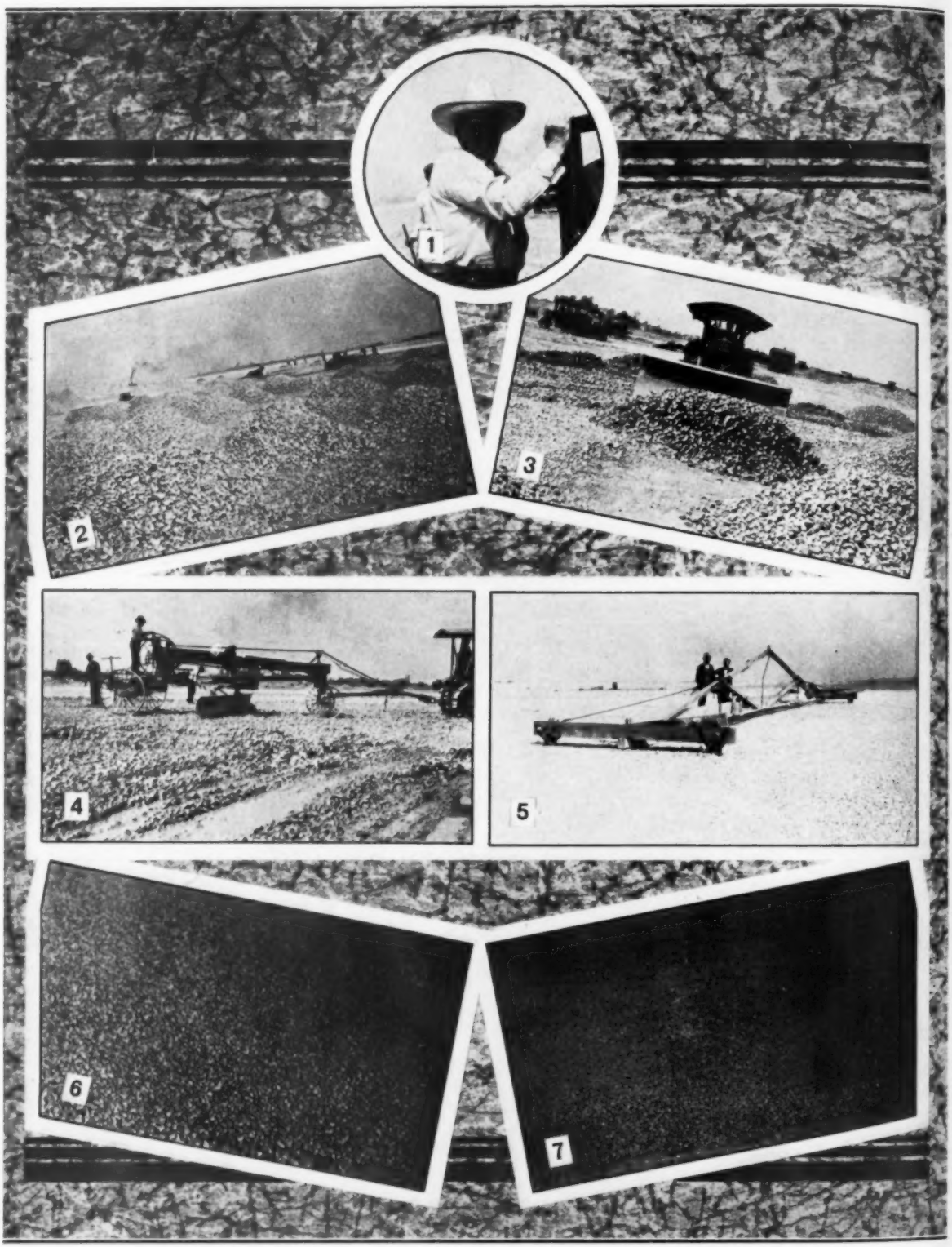
Contract excavation for the airport was started in the spring of 1929 and continued through that winter and through the construction season of 1930. The drainage system was started November 30, 1930, and work continued throughout the winter. Construction of the concrete drains was started early in March, 1931, at the same time that the runway blading was begun. Late in March, the first slag was put in and work was continued with remarkable speed considering the large area to be covered, so that the runways were complete early in September.

It is interesting to note that there were only 27 working days during which surfacing could be carried on between March 1 and June 1, because of Sundays, holidays and rain.

Equipment Used

A remarkable array of construction equipment was spread out over the large runway area. This consisted of twenty rollers, twelve of which were 18-ton, 3 wheel steam rollers, two 5-ton and 3-wheel gas rollers, and six 8-ton tandem steam rollers. These necessitated a number of wagons for the handling of coal and water.

During the winter in order to supplement hand work on drainage ditches, a ¾-yard Northwest shovel and a ¾-yard P & H gas shovel were used, as well as three truck-mounted cranes, one Universal, one Browning and one of such ancient vintage that the oldest member of the department could not remember the



METHODS OF SPREADING AND LEVELING THE BASE COURSE AND TOP COURSE SLAG ON THE ALLEGHENY AIRPORT RUNWAYS

1. L. F. Bechtel, Maintenance Engineer, Allegheny County Department of Public Works, who functioned as contractor on the project. 2. Piles of top course slag ready to be leveled off by the bulldozer. 3. The bulldozer in action. 4. A Stockland grader with a 14-foot blade pulled by a Caterpillar Sixty smoothing out the top course of base stone. 5. The 50-foot leveler used to insure a uniform grade and smooth surface of key stone. 6. The finished top of key stone slag. 7. The final surface after the fines were applied and rolled.

name of the original crane which had been rebuilt several times. It was, however, performing well. The slag was delivered from the Duquesne Slag Co. of Buttermilk Hollow, about one mile from the field, by Watson Bowser & Bro., the slag contractor. A total of fourteen county trucks, consisting of six 3-ton Graham trucks with dual pneumatic tires and eight 5-ton Mack trucks with solid tires, handled the supplementary hauling on the field. The slag, which was delivered by contract as mentioned above, arrived at the rate of about 3,000 tons per day.

There were three hired graders with 14-foot blades pulled by Caterpillar Sixties for handling the spreading of the slag on the runways.

Extent of Landing Surface

The total area of the landing portion of the field includes 365,000 square yards of hard paving. The principal runway is 3,850 feet long lying due east and west. Centrally located along this run is an Administration Building with circular park facilities about it. Constructed laterally right and left from this Administration Building are ramps leading to the location of six hangars. These hangars are so situated on depressed areas that only a few feet of the roofs of the hangars will stand above the landing portion of the field. These depressed areas are reached by paved ramps 200 feet wide, and having a grade of 2½ per cent. The total paved area including ramps and landing surface is 460,000 square yards.

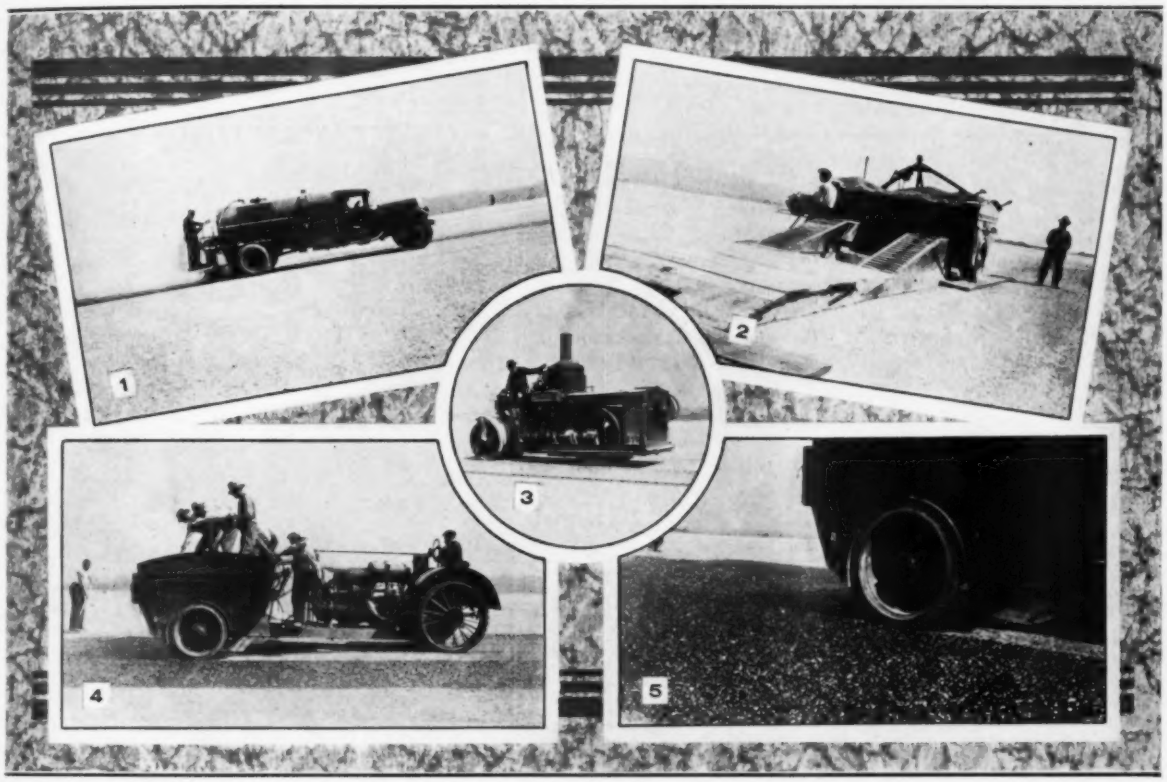
Identification Letters in Center of Field

Letters identifying the field as the Pittsburgh Municipal Airport are to be made in the center of the field in bitulithic paving around wood forms for the letters. Then, after the wood letters, made of three layers of ⅜-inch plyboard with the grain crossed, are removed, the area is to be paved with sheet asphalt which will take a white or yellow paint more satisfactorily than the bituminous macadam or bitulithic.

Personnel

The County airport was planned by Brooks Ross, Airport Engineer for the Allegheny County Department of Public Works, assisted by E. L. Smith, Chief Engineer, Bureau of Road Construction and Earl G. Kaltenbach, Special Engineer, who directed the design of grades, drainage and general layout.

After the paving, drainage and hangars had been designed, the idea arose that the construction of the airport might be used in assisting to alleviate unemployment and in stabilizing day labor wages in the county. The Board of Commissioners then decided that the paving and drainage work should be turned over to the Allegheny County Department of Public Works, Road Maintenance Division, to be carried on under the direction of John A. Fugassi, Superintendent of Maintenance, E. F. Moriarity, Assistant Superintendent of Maintenance, and L. F. Bechtel, Maintenance Engineer, this organization functioning as the contractor.



PENETRATING, SPREADING AND ROLLING ONE OF THE SLAG-MACADAM RUNWAYS

1. *Applying a seal coat of Tarmac.* 2. *The ramp device up which trucks were backed for loading 1-inch slag into the Big Sandy.* 3. *An 8-ton Good Roads tandem roller working on the seal coat.* 4. *Big Sandy in action.* 5. *Close-up of the spreader running over the newly sealed top.*

Perspective of the Golden Gate Bridge

Some Interesting Data on the Golden Gate Bridge

MORE than 174,000 miles of wire, enough to girdle the earth seven times at the Equator, will be used to spin the two 10,937-ton main cables and suspender ropes that will swing the new Golden Gate Bridge at San Francisco, Calif. Construction of this new bridge, which will be 9,200 feet long, including a 4,200-foot main span, two 1,100-foot and two 1,400-foot approaches, is to start soon. The bridge will cost $33,000,000, and will take approximately four years to build. It will have a 60-foot roadway and will be 90 feet wide between cable centers. The erection of a bridge across the Bay has been a dream of the citizens of San Francisco for more than a quarter of a century.

There are two major tasks in the construction of the bridge: one, the sinking of the piers to support the towers into solid rock, far beneath the swiftly rushing tides of the narrows in San Francisco Bay, and the other the spinning and erecting of the cables, costing $6,265,767, the contract for which has been awarded to the American Cable Co. of New York, an associate of the American Chain Co. The proportions of the cable task may be understood when it is realized that each of the 10,937-ton cables will contain 27,577 wires and each individual wire will stand a pull of 7,600 pounds. The method of spinning the wires which are about 0.2-inch in diameter will be in accordance with modern practice. A footbridge will be suspended from shore to shore with steps to the tower and then swung about 740 feet high across the 4,200-foot width of the main span. The wire will then be strung across the footbridge in strands of 452 wires each for spinning. When spun, the cables will be put in position on the towers after being anchored to each shore. At this stage, the cables will be about 4 feet in diameter. A special machine will be used to squeeze or compact each cable to its required 36¼-inch diameter. After the suspender wires have been attached from them to the bridge and they have been allowed to stretch, they will be wrapped with 10,571,000 feet of soft annealed double galvanized steel wrapping wire to prevent corrosion from the salt air.

The Golden Gate Bridge was designed by Joseph B. Strauss, of Chicago, who is also Chief Engineer for the erection. The consulting staff includes O. H. Ammann, Chief Engineer, Port of New York Authority, Dean Charles Derieth, Jr., of the College of Engineering, University of California, Leon S. Moisseiff, Advisory Engineer for the Port of New York Authority, and Professor Andrew C. Lawson, former Dean of the College of Mining, University of California.

A New Device for Facilitating the Use of Cordeau in Blasting

THE use of Cordeau-Bickford as an accessory for firing well-drill holes and coyote holes has increased greatly in recent years. In a well-drill hole cordeau practically constitutes a continuous electric blasting cap from the top to the bottom of the charge. This not only assures complete detonation but also allows the charge to be broken when necessary so that stemming material may be loaded between units of dynamite.

The usual method of firing well-drill blasts with cordeau is to use double-countered cordeau in the holes and plain cordeau as a main or trunk line on the surface. Heretofore, making connections has involved a considerable amount of rather delicate work. It has been necessary to slit the top of the down or branch line of cordeau for a distance of 6 or 8 inches and then to wind the two halves in opposite directions around the trunk line as tightly as possible. Connecting a large number of holes in this manner takes time, especially if it is raining or snowing or sleeting, and the weather is no respecter of a blaster's comfort. On a cold day one's fingers become painfully cold in making these connections, and moreover, if the T. N. T. which constitutes the filling of the lead tube of the cordeau gets wet, the branch line is likely to fail.

To obviate these difficulties the du Pont Co. has developed a cordeau connector which does away with the slitting and wrapping of the down line around the trunk line. This cordeau connector consists of two parts: a clip made of spring steel and a special cap made of copper having a bead at one end and looking somewhat like a rim-fire rifle cartridge shell. The upper or beaded end of this cap is filled with an explosive mixture similar to that in blasting caps and this mixture is held in place by an inner capsule having a minute central aperture. This inner capsule serves the double purpose of confining the charge and of preventing the lead tube of the cordeau from coming into contact with the explosive mixture.

To use this device, the copper cap is dropped through the aperture in the clip. The freshly cut end of the cordeau is then inserted in the lower end of the cap until it touches the inner capsule and the cap is crimped fast to the cordeau. After a connector has been attached to the cordeau extending from each bore hole, as described, the trunk line is laid between the wings of the clips, one by one, and the clip is sprung open with the fingers. The cordeau drops into contact with the loaded end of the copper cap and is held firmly in place by the release of the clip.

The advantages of this device are several. It makes a waterproof connection; after the cap and clip have been crimped on to the down line of the cordeau, weather conditions cannot affect it. The connection is made in a very short time and the device is simple and easy to use. It aids the blaster, saves time and gives a greater assurance of the detonation of all down lines of cordeau by a trunk line.

Depreciation *of* Equipment —

Each Job Should Carry Its Share

By

J. E. Gregory, C. P. A.

Farrington, Hyland & Gregory

Certified Public Accountants

New York City

MUCH has been written on this subject but few general recommendations have been expounded that would enable the average contractor definitely to determine the practices best suited to his enterprise.

In this age of machinery the cost expert is constantly being confronted with the necessity of treating depreciation as a direct cost rather than as an item of overhead. Ten years ago, before the advent of machine usage on so universal a scale, the elements of prime cost in all enterprises comprised merely Direct Labor and Direct Materials. Depreciation resulting from wear and tear, with provision for the elements of lapse of time, obsolesence, accident, inadequacy and fluctuation in final replacement costs, was treated largely as general overhead matters, and arbitrary allowances were charged to jobs in an attempt to cover the entire of all of these possible occurrences. This was guesswork pure and simple.

Today we are confronted with the matter of close figuring and machine usage to such an extent that those contractors who do not include more logical and proper allowances for the machinery to be employed upon a job, find themselves undertaking engagements without profit, due to this one element alone.

The trouble with the contracting business today, generally speaking, is not lack of working projects, but rather a lack of knowledge of all of the elements of cost that must be considered in estimating. Thousands have entered the field of general contracting during the past decade and have found that the net returns from their endeavors are nil, due primarily to their inability to comprehend all possible costs, and to estimate accordingly.

Many a contractor or group who has entered the field, and fortunately or unfortunately obtained a progressive series of sizeable contracts on the basis of low bidding, has found that due to lack of cost knowledge and with closer competition, he has been robbing Peter to pay Paul. The initial receipts from his second contract have gone to clean up his indebtedness on his first job, his third contract receipts cleared away his second contract obligations, and so on. This condition has been brought about through errors in financial management and through lack of ability to estimate properly. The contractor has made a living at the expense of those who reposed credit confidence in him.

Previous articles on these subjects in CONTRACTORS AND ENGINEERS MONTHLY have indicated a procedure that will at least check this condition at its inception. Better to undertake no job than to commit oneself to a losing proposition. The rectification can only come through intelligent estimating.

COST ELEMENTS OF BIDS

Believe it or not, the cost elements of all bids comprise seven features, as follows:

1. Material Costs, which can be figured very accurately.
2. Labor Costs, which can be estimated satisfactorily with proper allowances for pay rate disturbances.
3. Equipment Costs, which in this age replace labor and which for that reason must be treated in its place.
4. Subcontract Costs, which can be definitely ascertained from the bids of subcontractors.
5. Estimating and Bidding Expense, which can be a proper apportionment of the estimator's time at cost rates.
6. Other Costs, including entertaining, commissions, compensation insurance and bond completion costs, all of which can be ascer-

This is the tenth of a series of twelve articles appearing monthly during 1931, *covering tax, accounting and system problems as applicable to the contractor.*

Particular problems relative to either methods of accounting or tax matters may be directed to the offices of Farrington, Hyland & Gregory, Certified Public Accountants, Chrysler Building, New York City, or to CONTRACTORS AND ENGINEERS MONTHLY, *470 Fourth Avenue, New York City.*

tained with a very reasonable degree of accuracy.

7 Overhead Costs, which must be apportioned to jobs and applied thereto in the estimate on the basis of the ratio the known or estimated overhead bears to the total possible volume of business.

The average contractor, in estimating, has failed to properly consider (3), (5), and (6) above, and as long as he continues to do so he will be operating on a "Lord help us" basis.

To estimate and subsequently to record costs as applied to each job, implies that the contractor have before him at all times a complete schedule of his equipment, showing its disposition, location, carrying value, which means cost less depreciation or its appraised value when taken from prior jobs, the daily fuel consumption of each piece of equipment, the daily pay of the operator upon each equipment item if not figured in the direct labor element, and an allowance for daily possible equipment upkeep repairs. Much of this can be obtained from past experience, which proves the necessity of keeping operating statistics. Where there are no past experience records recourse must be had to guesswork estimate until such time as experience data are available.

Once the estimate is concluded and the job obtained, the estimate should be made a matter of constant reference by comparison with actual progress costs. The proper accounting procedure has already been discussed in previous articles, and reference is made thereto. The handling of equipment operating costs requires further development.

Each job is charged with all directly traceable costs, including under an Equipment Cost column all gasoline, oil, coal, insurance on equipment, machine repairs and supplies and operator's pay, leaving only the element of depreciation to be considered. Equipment which will be considered worthless with the expiration of the job upon which it is being used may be charged at once to this cost column, any salvage value being credited thereto when such equipment is removed. All manner of working tools should be treated in this manner.

DEPRECIATION

Rates of depreciation covering all other items of equipment that stand the strain of more than one contract, are scheduled for each piece of equipment based upon its estimated life, and the daily depreciation applicable in each case is determined. For example, a certain type of truck costing $4,500 having a life of three years or $1,500 per year in annual depreciation, develops a daily depreciation charge of $5. If this truck is used 100 days upon the job it would be correct to charge that job with $500 in depreciation. This would, of course, be accomplished progressively with the close of each month based upon the number of days the truck remained on the job.

It is assumed for the purposes of procedure explanation that the only item of equipment owned is the truck in question. This truck is carried as an asset item and is not charged out of this asset designation to the job, as is done in the case of tools and equipment that will be completely absorbed on the job, as it will be further available for use on other jobs. Let us assume that the truck was used on jobs as follows:

January	Job A ..... 10 days	Job B ..... 10 days
February	Job A ..... 25 days	Job B ..... no days
March	Job A ..... 3 days	Job B ..... 20 days

The daily depreciation is figured to the $5; the monthly depreciation $125; the annual depreciation $1,500. Let us assume that the truck is not used further during the year. Let us also ignore the question as to whether a truck depreciates on the same basis when idle.

At January 31 the depreciation entry charges Job A with $50, Job B $50 and an Idle Depreciation account with $25, which latter account is classified as a general overhead item, and credits the Reserve for Depreciation with $125. On February 28 the depreciation entry charges Job A $125 and credits Reserve for Depreciation in like amount. On March 31 the depreciation entry charges Job A $15; Job B $100; Idle Depreciation $10 and credits Reserve for Depreciation $125.

With the close of each month during the remaining nine, based upon the example given, Idle Depreciation is charged $125 and the Reserve for Depreciation credited accordingly.

It will be noted that the Reserve for Depreciation is periodically credited with the total depreciation chargeable to the period, assuring always the thought that full depreciation is being reserved, that part applicable to jobs being charged directly thereto and that portion representing idle time being carried under the general overhead caption indicated.

Reinforced Concrete Pavements

A 40-PAGE booklet entitled "Reinforced Concrete Pavements" has recently been published by the Wire Reinforcement Institute, Washington, D. C., and discusses the use of welded wire fabric as reinforcement in concrete pavements.

According to the foreword of this booklet, concrete pavement, properly designed and constructed, is generally recognized as the highest type of modern pavement. It possesses strength, desirable surface properties, durability and economy. In the matter of structural strength, the concrete pavement can be designed to meet practically any requirement. Long experience, extensive research and actual pavement surveys involving careful observation and detailed study of thousands of miles of existing highways, have all indicated conclusively that steel reinforcement is economically justified as an essential feature of concrete pavement design. Welded wire fabric is the outstanding material used for this purpose. Its design, installation, properties and general specifications for use as reinforcement in concrete pavements from the body of the pamphlet which contains much interesting and valuable data.

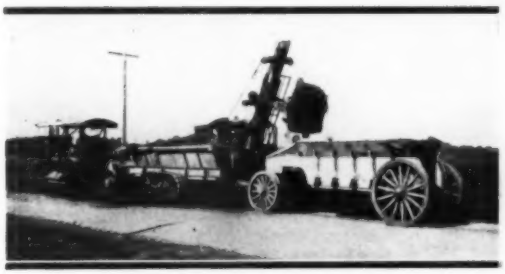
One-Sided Mistakes Cannot Be Avoided

"I made a mistake," said a Texas contractor. "I thought I was to build a four-room house, not a five-room one."

"Sorry, old man," said the Texas Court of Civil Appeals, in effect. "That is no excuse for not carrying out the agreement you signed. Better be more careful next time to make sure what you are signing." From the opinion of the court in this case (Woodward & Hardie v. McMillan, 34 S. W. 2d, 357):

"A mistake of one party to a building contract not induced by the other, such as mistake of the contractor in figuring the amount of his bid, or a mistake as to what plans are to be followed, will not invalidate the contract nor entitle the mistaken party to any relief."

Four Aggregates Handled *With* One Crane



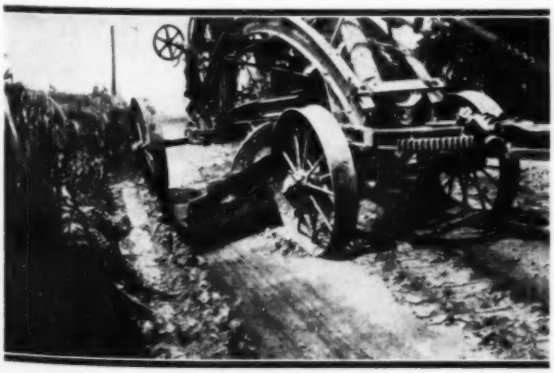
A P & H Shovel Loading Two Western Wagons Pulled by a Caterpillar Sixty

J. R. Griffith Co. on a 10-Mile Wisconsin Paving Job Used Crane with 50-Foot Boom and 1½-Yard Bucket to Unload All Stone and Sand from Cars to Batchers

THE John R. Griffith Co., of Racine, Wis., was the low bidder on two concrete paving jobs running from the Winnebago County line on the north through Rosendale almost to Waupun, Wis., on the south, a total distance of 18.1 miles, in the early lettings of 1931. Mr. Griffiths was one of a committee of contractors in the State which asked the Wisconsin Highway Commission to split up the longer jobs so that more men could be employed to relieve the unemployment situation in the State. In line with this policy optional bids were taken on Section I and Section II, 7.04 and 10.6 miles in length respectively. Bids were also received on Section I and II combined with the provision that if the contract was awarded on that basis the contractor would be required to provide two separate and complete outfits on the work. As this policy would have required a large additional investment for many of the contractors who had but one complete set of paving equipment, many of them sublet a portion of the work to another company which had not received work in the spring letting. Such was the case with the southern 7 miles of the Griffith contract which was subbed to James Cape & Sons Co., of Racine, Wis.

Rough Grading on the Griffith Contract

The excavation for this job ran about 10,000 yards per mile but the cuts were not deep in spite of this yardage as the right of way was 40 feet. One cut about 600 feet long ran 8,000 yards and an average of 12 feet deep. There were no large fills but long shallow ones to build up the grade in low spots. Work on the grade was started April 13, 1931, with two P & H 1-yard shovels. One worked with a Caterpillar Sixty hauling two Western crawler wagons, one 6-yard and one 7-yard, and the other with horse-drawn wagons. During the inspection of the construction camp, Mr. Griffith pointed to a large tent in the distance where the stock was stabled and said, "There is something you won't see much longer, but I am enough of an old-timer to hate to see the horses going."



Cutting the Shoulders and Ditches After Completion of the Concrete Road, Using an Austin Mammoth Senior Grader Pulled by a Caterpillar Sixty.

The dumps were leveled with a Caterpillar Sixty pulling an Adams grader with a 12-foot blade. Just enough hand labor to keep the rough spots touched up was used on grading. All the Griffith equipment is painted a distinctive blue so that anywhere on the job his own and hired equipment can be distinguished at a considerable distance with no difficulty whatsoever.

On shallow cuts a rooter plow was pulled through by a Caterpillar Sixty and then the dirt was moved with a 2-yard Euclid Tumble Bug rotary scraper, one of the largest used in Wisconsin for this type of work.

Working the Fine Grade

During the last week of June the hot weather that caused so much suffering throughout the middle west was a source of great concern to many paving outfits where the work was through open country. The Griffith outfit usually worked with a half-hour for lunch but during the excessive heat this was prolonged to a two-hour rest period at noon and was found most beneficial both to men and equipment. The men responded remarkably well to this thought for their welfare, making up the time when the sun was low in the evening. There was also less trouble with tires on the heavy trucking fleet that hauled over the rough grade to the paver.

The fine grade was cut first by the Adams grader and then trimmed with a Caterpillar Thirty and 5-foot Tumble Bug and a Caterpillar Twenty and a patrol grader. A Ted Carr Formgrader cut the standard trench for the 9-6½-9-inch section for the setting of the Metaforms. A Wehr one-man power grader trimmed the grade and the two form setters on each side kept the forms about 700 feet ahead of the paver. The subgrade was cut to section then by a Lakewood subgrader pulled by the Caterpillar Thirty. About eight men were kept behind the subgrader to hand shovel the windrows of earth cut by that machine. All heavy moving was handled by the rotary scraper and tractor. One of the fine grade crew kept the forms oiled well ahead of the paver.

They Said It Was Impossible

When some of Mr. Griffith's friends in the contracting game heard that he intended to handle all his aggregates with a single crane unloading from the gondola cars to stockpile and to the bins, he was told that he was attempting the impossible. A well-conceived layout for the unloading and batching plant and the use of a Northwest crane larger than is usually employed for this work and a 1½-yard Kiesler clamshell made the scheme work without a hitch.

The spur track was capable of handling four cars within the range of the crane with its 50-foot boom. The sand and gravel were received in gondola cars from the Elkhart Lake Sand & Gravel Co., Elkhart Lake, Wis. There was sufficient space between the spur and the two Butler bins which were spotted about 50 feet apart with a stockpile between them for the crane to move from one bin to the other. The first bin under which the 2-batch trucks backed had the two larger sizes of gravel and then the second held the small stone or pea gravel and sand. The weights per batch were: large stone, 1 to 2½-inch, 620 pounds; medium stone, ¾ to 1½-inch, 992 pounds; pea gravel, ¼ to ¾-inch, 868 pounds; sand, No. 1740 for 545 pounds of bulk cement. About sixteen cars of aggregates were unloaded each day without any difficulty with the single crane by one operator. The cars were moved along by pinch bar or by the crane as required. There were two men in the gondola cars spotting the big bucket and cleaning up to keep things moving. These men also moved the cars as needed. The remaining yard crew consisted of the crane operator and the two batcher men. There was also one man picking sticks and any other extraneous material from the stockpile or bins when loading.

An "Armstrong" Bulk Cement Plant

Mr. Griffith has long been a user of bulk cement and uses what he chooses to call an "Armstrong" plant for handling the material. It is a system which he has devised and builds with a little variation to suit the loading conditions at his various jobs. Badger State brand cement was received in box cars at the end of the spur and five men used to unload with concrete buggies. There were four men loading the six buggies and one man weighing and dumping into the trucks. The cement dock was built at the elevation of the box car door and the truck driveway into which the batch trucks backed was depressed so that the canvas hangings to prevent spreading of the cement in dumping would touch the top of the batches. A back board or baffle was built at the opposite side of the dumping dock so that the cement could be dumped quickly and be thrown back into the batch without loss. Since bag cement has always been stored on the job against a possible shortage or failure of the railroad to deliver the daily requirements with sufficient speed, Mr. Griffith has used a large shed close by the cement dock to store bulk cement with great success.

From Batcher Plant to Subgrade

A fleet of ten of the well-known blue-hued trucks supplemented by a maximum of seven hired trucks was used to haul the batches, two to a load. The trucks turned through the forms and backed to the Rex 27-E paver. A very active man handled the dumping of the batches and watched that none of the batch remained in the truck. The paver operator spread the batches very uniformly so that the work of the four puddlers was not too arduous. The paver pulled a Carr tail-grader which was attended by two men who shoveled out the excess earth as it was cut by the machine. These same men also handled the paver hose and sprinkled the subgrade.

This project was built under the Wisconsin specifications which require 6-inch mesh fabric reinforcing placed in mats full width of the 20-foot pavement, a continuous longitudinal plane of weakness 2½ inches deep, and transverse planes of weakness also 2½ inches deep at intervals of 30 feet. An expansion joint 1 inch wide of Carey premoulded material was inserted every 90 feet and came within ½-inch of the top of the pavement. Four-foot dowels of ½-inch deformed bars were laid every 2 feet across the longitudinal plane of weakness and ten ⅝-inch dowels across each tranverse plane of weakness with metal sleeves on one end of each dowel. The dowels were supported by steel pins resembling shoe horns with pointed ends. Two steel men placed the dowels and the mesh. The dowels were placed before the pouring of any concrete and the mesh after a layer had been spread to approximately the proper elevation to keep the fabric about 2 inches from the top of the slab.

Following the puddlers came the Lakewood double screed and the Heltzel Cleft-Plane machine from which the operator and a helper inserted the longitudinal

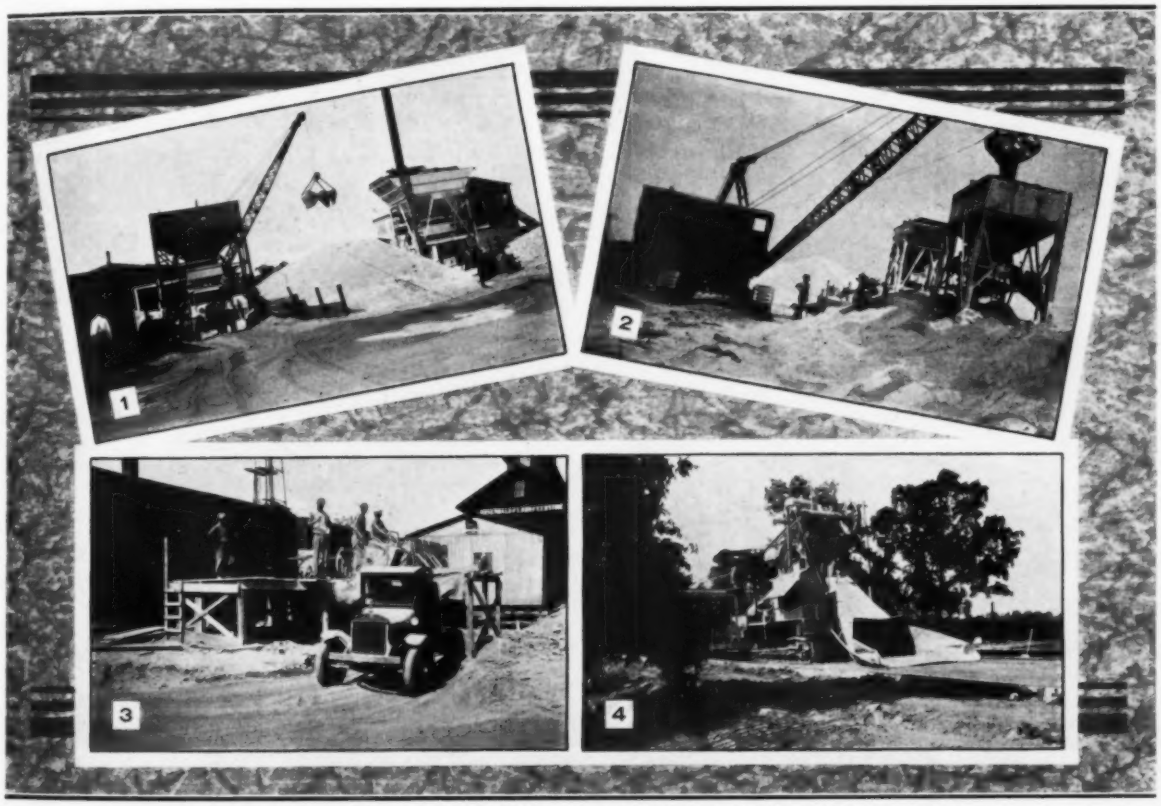
weakness plane and the 30-foot transverse planes. The 90-foot Carey expansion joints were placed as the concrete was poured. In addition to the two men on the Cleft-Plane machine there was one man who cleaned the forms on both sides of the machine to prevent any concrete adhering and hardening on the forms, making them harder to clean later.

From a twin roller bridge immediately behind the Cleft-Plane machine two men used the 10-foot "bull float," or longitudinal float and then used the two canvas belts, each 8 inches wide, and straight-edged the pavement. A second rolling bridge behind the bull-float men carried the two men who pulled the center and the transverse wedges and edged the pavement.

ONLY ONE PUMP USED FOR WATER SUPPLY

Water for the paver and for sprinkling the burlap and earth cover was supplied through 2½ and 2-inch pipe from a stream alongside the right of way by a Rex triplex road pump. Taps for the paver and sprinkling hoses were inserted about every eight lengths of pipe or 160 feet. The paver carried 125 feet of 2-inch Bullock brand hose.

Paving on this job was started from the north end, working toward Rosendale, where the batching plant was located. These 6 miles were completed in 30 working days. Then work was carried to the south end and paving carried back to the batching plant. This required two locations for the road pump.



HANDLING FOUR AGGREGATES AND CEMENT FROM CARS TO ROAD

1. The aggregate layout where a Northwest crane with a 50-foot boom and a 1½-yard Kiesler clamshell bucket handled the four aggregates from freight cars to the two Butler bins. 2. View of the crane swinging from the cars to the bins. 3. The "Armstrong" bulk cement dock, a well-designed unit where a minimum of cement was lost. 4. The Rex 27-E paver running between the parallel lines of Metaforms.

They also pulled the bulkheads for the expansion joints, which were poured. The following day the plane of weakness slots were poured by two men using a Littleford tar kettle and hand pouring pots.

Two men spread the burlap and sprinkled it as soon as the finishers had completed the straight-edging. The burlap was carried forward by the same men and team that handled the forms and was spotted along the shoulder ready for the spreaders. A crew of about fourteen men took care of covering the pavement with earth the day following, pouring and sprinkling the cover for a period of 7 days. Two men with two helpers and two teams pulled the forms, stacked them on the wagons and brought them, and the burlap, forward.

WORKING AGAINST TIME

As there was a time limit of 115 days on this job, the contractor deemed it necessary to have as many gangs as possible working in order to complete the job on time. On the north end of the job there was a shouldering crew consisting of two gangs. One crew for roughing in and burying stones consisted of a P & H 1-cubic yard shovel, two trucks, two to four teams and an Austin-Western 12-foot grader. The other gang of about twenty-five men put on the final touches.

A COMFORTABLE WAGON CAMP

The Griffith organization carries a camp of ten

(Continued on page 72)

Machine Excavation *at* 40 Cents *a* Yard

Hand Excavation *at* $1.18 *a* Yard

The Story of Topeka's New Reservoir

By
Paul Montgomery

The Portable Mixer with Tower Pouring Walls

IT is not often that a construction company of long years' standing and most modern in present practices willingly goes back to older methods. Such a thing did happen recently, however, with the F. M. Spencer & Son Co., successful general contractors in Topeka since 1887. Topeka, Kansas, in common with other municipalities, had an acute unemployment situation to solve as the winter of 1930 set in. In an effort to relieve this as much as possible, a surplus of some $160,000 in the Water Department was utilized to build a much needed 10,000,000-gallon water reservoir to augment the present municipal system. A contract was let on competitive bids to F. M. Spencer & Son Co., and they were instructed to start at once. As the use of modern construction equipment relieves the labor situation but very little the sum of $11,000 was added to the contractor's estimate with the agreement that one-half of the total 22,000 cubic yards of excavation should be done by hand. This meant that 200 men would receive three days a week of much-needed labor. Here was an opportunity to compare costs on the same job. The same dirt, the same weather conditions and the same haul. Nothing could be more ideal for the test.

Comparing Machines and Muscle

Two P & H gasoline shovels and twelve 3-yard trucks worked on one side of the 237 x 298-foot lot, one hundred shovelers and twenty-three 2-yard trucks on the other. Labor worked an eight-hour day at 40 cents per hour. The size of the lot where the laborers worked permitted plowing on one side with plenty of room left for the shovel crew loading from both sides of the trucks. Good weather made an even break for both sides, but a slight slowing up was caused by a twice-a-week change of labor crews to permit other deserving men an equal opportunity to provide food for themselves and families. Perhaps this slight handicap was offset, however, by the willingness of the rather high grade type of labor, anxious to show their appreciation by hard work. Good trucks were provided for both sides and there were no delays in dirt haulage for either. Mr. Spencer had wisely insisted on the city supplying a time keeper and there was a slight saving in accounting costs, but adding all things together, the labor crew cost about what it should have under ordinary circumstances.

On the machine side a like condition prevailed. Both shovels were in good repair and operated continuously. The machine trucks were in a like condition and operated similarly.

When all was ready a whistle was blown and they were off, man against machine. It turned out to be a thirty-day race, but very early a small island appeared

to separate the two contests. This island remained as it was until the concrete walls were poured. In a reminiscent mood, Earl Spencer stood on it and looking one way he was carried back to his pre-college days, the time when he carried water to his father's labor crews. Looking the other way, he could see his own modern method of machine dirt removal. This island of earth represented a $1,000 opportunity to hold back the dirt for wall backfills until it was needed. When this time arrived there was but one handling and no ground storage rentals to pay.

Relative Costs

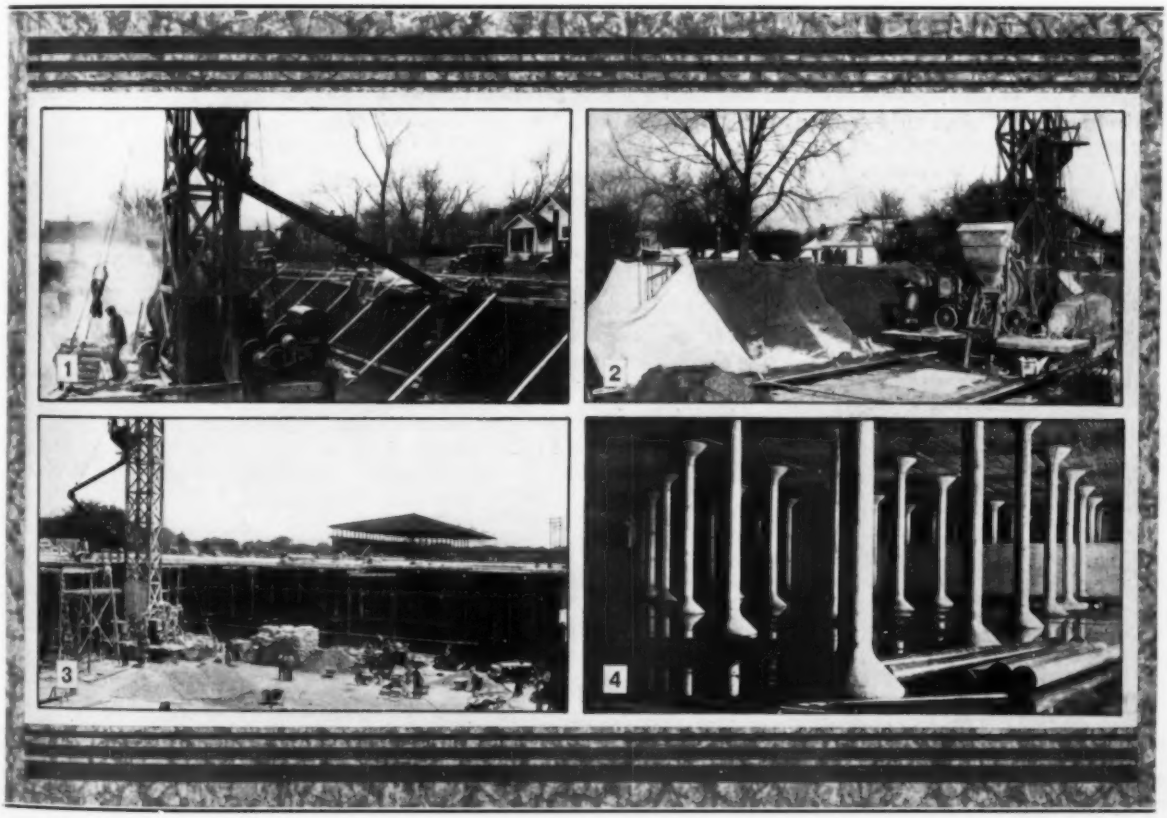
The City Engineer had estimated the hand labor cost would be $1.25 per yard and Spencer's shovelers moved it for $1.17½ per yard, but the power shovels removed their share of the dirt for 40 cents per yard, a nearly three to one penalty against hand labor. Under ordinary circumstances this would have been an economic crime, but economy had no place in this picture. There were deserving men to take care of and Spencer was paid for the difference and the people of Topeka were satisfied to foot the bill.

Pouring the Concrete by Machine

As the last shovelers climbed out of the hole there appeared a modern, efficient 20-ton portable mixing plant to take their place. This plant poured all the wall, roof and floor slabs as well as the footings. A 65-cubic foot wood tower with a hoist handling a ¾-yard concrete bucket was the first unit. The height of the tower was necessary to provide a free gravity flow of concrete to the roof slab while the mixer operated at floor level. On a platform 18 x 24 feet, at the base of the tower, was mounted a 14-S Rex mixer, a 35-horsepower Clyde hoist and storage space for 200 sacks of cement. Built for winter work the base also carried a water heater and a Littleford pressure oil burner to heat the mixer.

Water hose of sufficient length carried water to the machine. As this 20-ton machine had to move itself into all four corners of the reservoir, swivel wheel trucks were used and quick right angle turns provided for by jacking up the machine momentarily and shifting the wheel trucks. The tower proper was permanently anchored to the base by four lower cable guys. This necessitated the use of only two upper guys anchored to outlying stakes, which were easily and quickly moved. The machine moved on a 5-inch steel channel track mounted on 12 x 12 creosoted timbers 20 feet long. Mobility was provided for by the Clyde

(Continued on page 72)



METHODS OF HANDLING CONCRETE UNDER VARYING CONDITIONS IN POURING THE WALLS AND ROOF OF THE NEW TOPEKA RESERVOIR

1. *The concrete was placed regardless of low temperatures with water and aggregates properly heated. As soon as the concrete was placed, it was covered with canvas and kept warm.* 2. *The same area as shown in the first photograph the morning after. The outside temperature was 6 degrees above zero and the temperature under the canvas was 80 degrees.* 3. *The portable plant pouring the concrete roof slab of the reservoir.* 4. *The interior of the reservoir when completed showing the baffle wall in the background which divides the reservoir in equal parts so that the water may be drawn out of one and that half of the reservoir cleaned.*

How the Other Fellow Did It

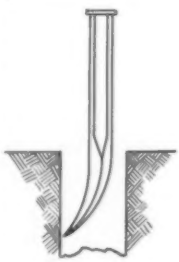
Construction Briefs

Speeding Up Production with Three-Up Wheelers

113. One of the oldest methods of moving dirt throughout the south is with three-up mule teams on wheeled scrapers. When considering hauling dirt by this method, there is little that can be done to speed up a mule team, as a mule is a mule and he has a rather definite gait. The place that the job can be speeded up is in loading. Several southern contractors have put in tractors with plows to loosen the dirt in the bank where the wheelers are loading. It is true that dirt has always been loosened for the two-up and three-up mule teams and plows, but consider a Virginia contractor who runs his tractor and plow into the field, loosens up half an acre of material, enough to readily take care of the wheelers for a number of hours and then unhitches the plow, goes over to the fill and uses the tractor and bulldozer to spread the material as it is brought in by the wheelers. Thus, one piece of machinery very effectively speeds up the amount of finished work produced by a given number of wheelers in one day. 21.2.69

A Chisel for Chipping Jobs

114. A chipping chisel for cutting holes through walls or floors where the holes have to be larger than is convenient to cut with star drills, has been devised by Leroy Phillips of Hutchinson, Kansas. He offers the idea as one particularly helpful to contractors. Have a blacksmith turn the point of a bull point about ⅛-inch beyond the side line of the body of the bull point. The point should be bent parallel with the cutting edges that form the point, as the tool will cut better this way and leave a straighter wall. L. P. Ks.



Sketch of the Chipping Chisel

Carpenter's Level on Grader Helps Cut Shoulder to Proper Slope

115. A Wisconsin contractor has developed a novel and very effective method of insuring the exact slope for the shoulder from the concrete road. The specifications call for a 2-inch slope in 10 feet. That is a very small slope for a man operating a large 12-foot grader to make accurately. There are, of course, plenty of old timers who will come mighty close to it but there are plenty who will miss it by a lot.

After leveling up the grader frame this contractor set the blade for the proper slope and then carefully set a long carpenter's level on the grader frame with a block under one end so that the bubble was in the center. The level was held firmly in place with U-bolts around the frame members and was a permanent part of the grader from then on. In operation the grader operator set the blade at the elevation of the concrete or a little above to allow for shrinkage and rolling and then with the spirit level showing the bubble in the center he was sure that his blade was cutting the required slope without any further worry. This is another of those little things that help to make a job accurate and at the same time take a lot of worry off the shoulders of a faithful worker and eliminate a lot of discussion between the inspector and the contractor.

TR-7:1:31

Saving a Man at the Paver

116. In the Carolinas last summer, one large contractor used a slightly different organization around his paver, which made for speed and smoother operation. The batch trucks each received six bags of cement per batch at the cement platform near the batching plant and then were reversed on a turntable just ahead of the paver. The bags were cut by one man as the trucks backed from the turntable and were then emptied by a second man. These two men had time to cut all of the bags and to empty the bags of one batch before the truck under normal operating conditions reached the paver, ready to dump the first batch. Then, the man at the paver who collected empty bags climbed on and emptied the bags of the second batch, collected all twelve bags, stuffing eleven of them into one bag, so that the truck could haul them back to the batching plant where one man baled them for return to the cement manufacturer.

There was one man to dump the trucks at the skip and he was very effective in speeding the movement of the trucks. There was a mixer operator and an oiler on the paver. The oiler also oiled the forms just ahead of pouring. He used a 5-gallon insecticide sprayer with oil and effected a material saving in the amount of oil used, as well as applying it evenly and very rapidly.

A subgrade planer was attached to the paver. This and the grade check board or template required by state specifications were operated by the final grade crew of four men who shoveled any earth away from the planer and also put the final touches on the grade.

Only three men were used to shovel the concrete, space along the forms and shovel as needed to the strike-off of the finisher. One man gave his entire attention to the screed. There were three hand finishers who edged around the expansion joints and forms, floated the surface, and used the roller to take out any excess water brought to the surface by the screed and finally belted the surface. 21.1.60

Making Accurate Bends in Large Pipe

117. A Pacific Coast contractor has developed an accurate time-saving method for making miter bends in 20-inch pipe for a natural gas pipe line. The usual procedure requires rotating one section of the pipe 180 degrees in order to match up the ends for the bend. This contractor cut a 22.5-degree gore from a piece of 20-inch pipe to use as a template. It was cut in two at the widest part and a hinge welded onto the two halves. Lug sections were welded onto the two ends to aid in maintaining the proper curvature of the template. The outside edges were beveled to facilitate marking the pipe. The center sections of the two halves of the template were cut out to reduce its weight and handles formed from pieces of welding rod were attached across these center sections. In making the cut with this template a section 6 inches long on the back wall of the pipe was left uncut which aided in maintaining correct alignment. When the cut was made and the section removed, the 6-inch uncut section in the back wall was heated with the blow pipe and the pipe was then bent around to the correct position without any lifting. A 45-degree bend requires two cuts and welds, and a 90-degree bend four cuts and welds. Spacing between cuts is determined by construction details, but, wherever possible, long radius bends were used for this large diameter pipe. 21.2.96

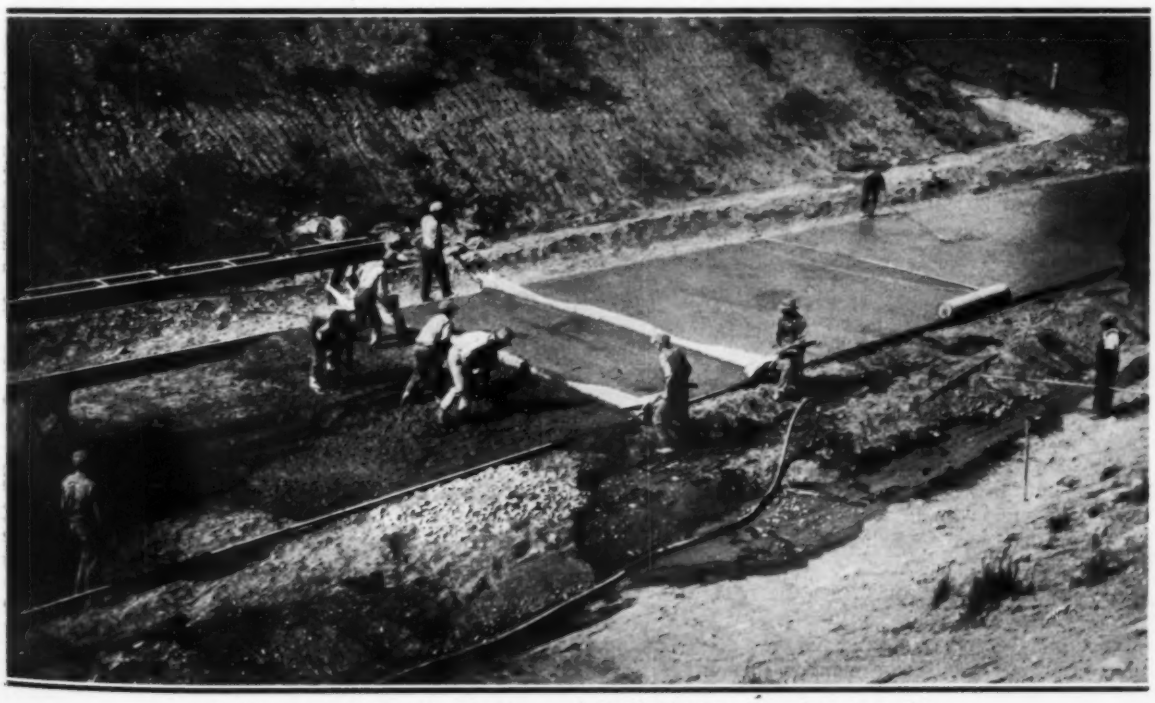
Double Shift *on* Gravel Pit *for* Ontario Concrete Job

Archibald-Birdsall, Ltd., Paved 6.15 Miles of Road with 10-7-10-Inch Section West from Orangeville

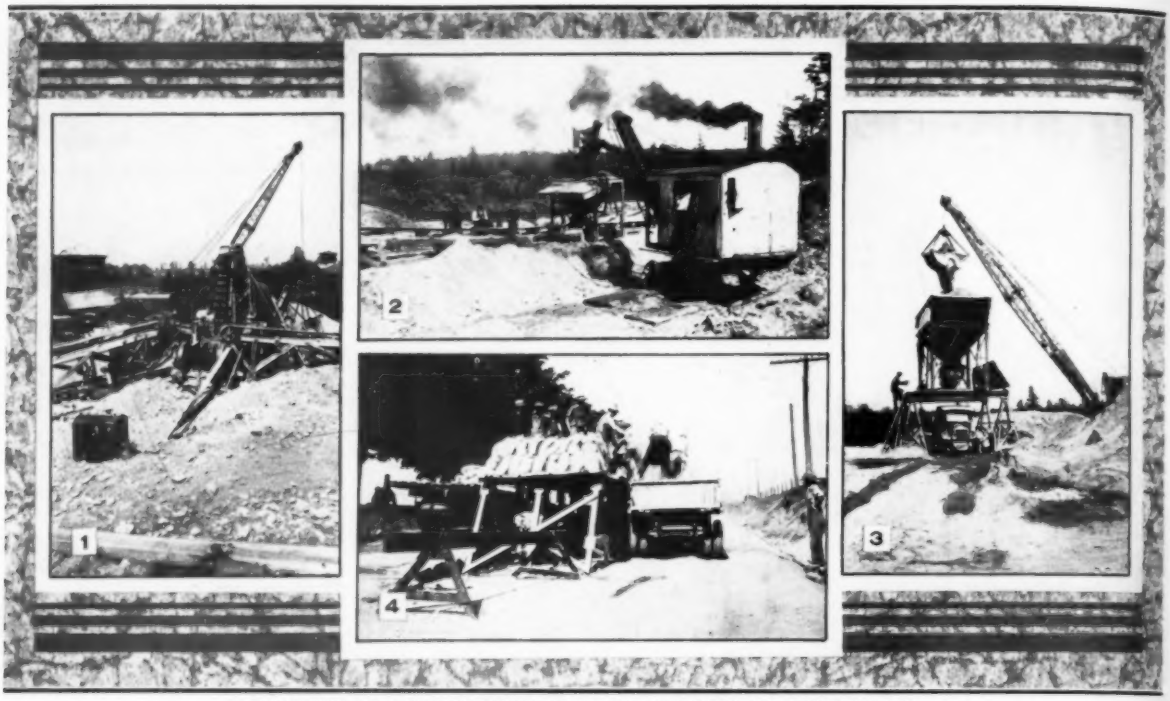
IN spite of a fine layout at the gravel pit where all the aggregate for the Archibald-Birdsall contract running west from Orangeville, Ontario, was secured, it was necessary to double-shift the pit operation to keep up with the paving requirements. The pit was located about 0.8 mile beyond the west end of the job, giving an average haul for batches of about 3.5 miles. The hauling of both cement and batches was done by subcontract with a fleet of trucks on batches running from five to twenty-one maximum.

Producing the Aggregates

A well-planned layout at the gravel pit made possible a maximum production with the minimum of labor and equipment. Except for some minor trouble with the bucket elevator which handled the material from the crusher to the screen, the outfit worked admirably throughout the contract. An Erie ¾-yard steam shovel operated against a face of about 15 feet and loaded the bank material onto one of the two 100-foot Link-Belt 24-inch belts. The shovel loaded directly to a steel hopper with a control gate in the bottom to spread the load evenly on the belt which delivered it to a sloping bar grizzly over the boot of the bucket elevator. Oversize stone went into the 14 x 24-inch Mitchell jaw crusher and then to the bucket elevator. The elevator seemed to be a bit light for the work at the start but when strengthened it pulled well with the rest of the plant and ceased to be



Puddling, Hand Screeding, Rolling, and Hand Floating Operations in a Cut



PREPARING THE AGGREGATE FOR AN ONTARIO HIGHWAY

1. The Mitchell jaw crusher and Stephens-Adamson circular screen showing the feeder belts from the right and left, the Hercules power unit for the crusher and in the background the crane and batcher plant. 2. An Erie steam shovel in the pit filling the loading hopper for the belt conveyor. 3. A Lorain 75B loading the batching plant. 4. The cement platform showing a delivery truck unloading at the left and a batch truck receiving the proper number of bags of cement per batch at the right

the weak link in a strong chain. The two delivery belts from the shovel were arranged at an angle of about 150 degrees, giving a wide range of operation for the shovel without changing the set-up of the belts. The steel hopper which fed the belts was shifted from one belt to the other as the shovel moved along the face and thus saved a second installation.

The bucket elevator from the crusher delivered the material to a 48-inch Stephens-Adamson circular screen and the fines from the screen went directly to a sand washer of the same make. The over-size, of which there was a scarcity, was allowed to waste at the far end of the screen. The sand ran to a stockpile at the left and the stone from the screen at the right from which a Lorain 75B with a 1½-yard Owen clam-shell bucket delivered the material as required to the Blaw-Knox 50-ton batcher plant. Each piece of equipment in the pit was separately powered. The crusher was run by Hercules power, the belts by two 10-horse-power Novo engines and the washer by a LeRoi engine.

The operating crew for the sand and gravel pit consisted of the operator for the Erie shovel and a fireman, one hopper man, one man on the crusher, one man to attend to all the gasoline engines, a crane operator, a batcher man and a foreman. A 4-inch two-stage centrifugal pump powered with a Waukesha motor supplied water to the washer through a 4-inch line from a nearby creek.

The 2-batch trucks drove from the road in a wide circle to the batcher plant and under it without backing, receiving the stone and sand and then drove through and out to the road. The cement was loaded by four men from a large platform located at about the middle of the job at a convenient crossroads. The cement was hauled by contract from a siding at Orangeville and unloaded from the hauling trucks at one side of the platform, and bags were cut and then emptied directly onto the batches as the aggregate trucks stopped at the platform on the other side. The cement haul was about 3.5 miles from Orangeville.

FINE GRADING OPERATIONS

The heavy grading on this project was done the previous year under a separate contract by another organization, leaving the paving and the necessary fine grading only for the 1931 operation. The contractor started the fine grading May 26, 1931, with six hand laborers, and an Adams No. 51 grader with a 12-foot blade pulled by a Monarch 50 tractor. The cuts and fills ran about 6 to 18 inches which were readily handled by the blade grading outfit. A Buffalo-Springfield 12-ton steam roller was used to compact all fills and to roll the grade ahead of the paver.

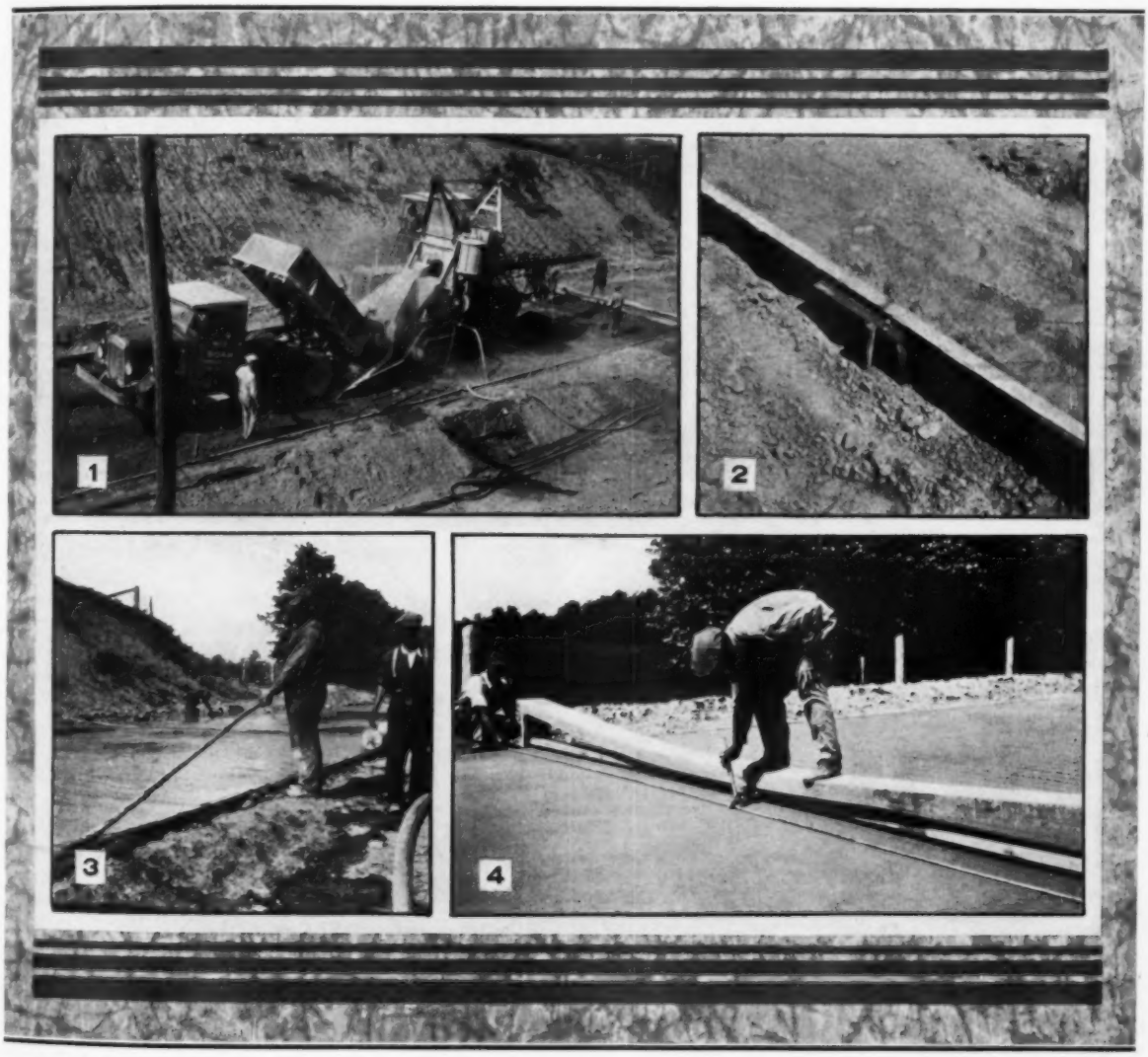
As is customary on most Ontario paving operations wood forms were used. The reason is that steel forms are needed chiefly where finishing machines are used and the Canadian duty on these machines is so high that hand screeding is resorted to in practically all cases. As yet no manufacturer from the States is making machines for finishing in Canada which would probably tend to greatly reduce the price and create a demand for them. It must be said that Ontario concrete roads do ride unusually well and that excellent results are secured by the contractors with both one and two hand screeds. Wood forms averaging a little less than 16 feet in length and of 2 x 10-inch lumber were

used on this job for the 10-7-10-inch section. These forms were oiled every other day which practically meant that they were oiled each time before using. The forms were set by one form setter with two helpers after the thickened edge trench had been cut quite accurately by the grader. A crew of about five men trimmed ahead of the form setters.

On the fine grade just ahead of the paver there were but two men who checked the grade with a template, and hand shoveled to correct any irregularities in the grade. The forms were usually about 1,500 feet ahead of the paver although only 500 feet were required by the specifications.

POURING THE JOB

The 2-batch trucks with their 7-bag batches of 1:2:3 mix measured by volume turned on a Blaw-Knox turntable about 300 feet ahead of the MultiFoote 27-E paver and backed to the skip. At the paver one man quickly dumped the batches as required into the skip and assisted in moving the hose when necessary. The paver operator looked after his machine, greasing and oiling it daily. Behind the paver one man set the Truscon center joint as close as possible to the machine and staked it with six pins. There were four men shoveling concrete and spading against the forms and also four screed men. When this job was visited the paver was working up hill and it was obvious that the four men were needed with two screeds but most of the Ontario contractors carry only two screed men. The heavy screeds were shod with a ¼-inch steel plate. On this job the first screed was used as a tamper and the second as a screed to smooth off the concrete to as fine a finish as possible in order to minimize the work of the hand finishers. The two hand finishers first used a weighted roller to remove excess water



PAVING AND FINISHING THE SLAB ON THE ARCHIBALD-BIRDSALL JOB NEAR ORANGEVILLE, ONT.

1. One of the trucks of the batch fleet delivering a batch to the skip of the MultiFoote 27-E paver. 2. A detail of the set-up of the wood forms. 2. An unusual piece of finishing equipment used with great skill by the operator—a stick float. 4. Putting a corrugated safety tread on a grade. Three men took turns pounding this ½-inch rod on the green concrete to give a non-skid tread and a footing for horses. They worked from a 20-foot bridge spanning the slab.

from the surface and then two canvas belts, the first 6 inches wide and the second 8 inches wide. These same men edged the concrete and used the Lakewood aluminum straight-edge to check the surface for irregularities.

There were two men placing the burlap as soon as the initial set had taken place and then two sprinkling the burlap. The burlap was left on overnight and then removed by the same man who, with the sprinklers, placed the 2-inch earth cover. The burlap, sprinkling and earth cover as well as its removal were handled by a subcontractor on a linear-foot basis. The earth was left on the surface of the slab, which was poured the full 20-foot width in one operation, for 21 days and was sprinkled only for 14 days.

WATER FOR THE PAVER AND FOR SPRINKLING

Two pumps were used for the water supply for the job. They were spaced quite far apart and made it possible to cut the 2½-inch water line between the paver and the sprinkling operation as soon as the paver had passed the first pump near the Orangeville end of the job. In this way it was possible for the paver to have better pressure. As the contractor did not have as complete control over the subcontractor's men on sprinkling as he had over his own, there were times when taps were left open which would have proved detrimental to the paver operation had the paver been on the same line as the sprinkler. The taps in the water line were placed about 150 feet apart and the paver carried about 150 feet of hose. A Barnes triplex pump was used at one end and a C H & E No. 9 at the other end.

PERSONNEL

With the organization described the contractor was able to average 1,100 feet of 10-7-10-inch section pavement 20 feet wide per 10-hour working day. The least run for a full day's work was 959 feet and the best 1,206 feet. Archibald-Birdsall, Ltd., is a new contracting organization composed of J. W. Archibald, G. Birdsall, and R. V. Daniels, the latter acting as Superintendent. For the Ontario Department of Public Highways the work was under the direction of S. A. Cummiford, Resident Engineer.

The Story of Topeka's New Reservoir

(Continued from page 67)

tower hoist with a cable and dead man anchorage. As it was not necessary to take down the wood tower at any time, movement of the big plant was accomplished with only a 4 per cent labor loss. The complete plant was constructed out of machines and equipment on hand in the Spencer storage shed.

The portable mixer first poured the 15,000 square feet of footings and 22,000 square feet of wall and then poured alternate sections of floor slab. As soon as the floor slab was cured carpenters were put to work erecting the roof forms under a subcontract by the Elmer Sigler Form Co., Kansas City, Mo. Adherence to schedule eliminated all delays in pouring. While one roof section forms were being erected the mixer poured floor slab in another section returning to pour the roof sections as completed. In this manner all floor slab and all roof slab and wall were completed except a small square 32 x 56 feet in area. In the meantime the roofers completed the covering of the major portion of 71,000 square feet of roof beside installing 1,100 feet of gutter around the walls. Then the portable mixer pulled itself out of the hole on a plank bridge and finished the rest from the outside. It had done its job with from 12 to 14 men less than would have been necessary to operate a stationary mixing plant of the same capacity.

WINTER CONCRETING

During the winter the aggregates, water and concrete itself were heated. A spread of tarpaulin permitted this pre-heated concrete to maintain a temperature of 80 degrees in walls and footings until all danger of freezing was past. Outside temperatures, at the same time, went as low as 6 degrees above zero.

An admixture Ash Grove Quickard used with regular portland cement made it possible to save a half a sack in every three of cement or 20 cents per cubic yard. The cost was reduced, the strength went up and the concrete was more workable, honeycombing was reduced and there was no segregation of aggregate or loss in volume. There was no extra labor penalty to this method, a slight additional cost of measuring the cement was counterbalanced by the fact that less cement had to be handled.

HANDLING STEEL AND AGGREGATES

Reinforcing steel and aggregates, instead of being delivered to common stockpiles outside the walls, were set in a number of piles in various places within the reservoir to permit quick use with a minimum of hand labor. Standardized round, metal forms were used on the 154 roof column supports to good advantage. Wall forms were made in uniform, movable sections, which permitted use of a minimum amount of form lumber for this purpose. A detached pump house and water duct presented no difficulties and were completed while the portable mixing plant took care of the last pouring.

Four Aggregates Handled with One Crane

(Continued from page 65)

wagons built on old truck chassis. In the bunk houses there are eight men to a wagon and twelve men were cared for in the one remaining portable sectional house. Two of the wagons placed end to end and with the two adjacent ends removed made a long dining hall. One large wagon with the ice box in one end and living quarters in the other took care of the commissary and provided a home for the cook and his wife. A total of fifty men were boarded in the camp which was located in an attractive grove well shaded from the glare of the sun. A combined office and bunk wagon was used by Mr. Griffith and was furnished with Quaker oil heaters for the early and late work that every contractor faces in starting a job in the spring or completing a late job in the fall.

PERSONNEL

The J. R. Griffith Co., Racine, Wis., is ably headed by John R. Griffith, who stays close to the job, and has a reputation for high quality of work and square dealing among his fellow contractors. He is one of the older group of paving contractors in the State with many miles of road to his credit. This project was in charge of J. R. McGuire, Resident Engineer, for the Wisconsin Highway Commission.

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ENGINEERS MONTHLY
Devoted to
News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

October, 1931
New York
Vol. IV, No. 4

Small Infiltration of New Trunk Line Sewers for Westchester Sanitary Commission

Office of
W. W. Young,
New York City

THE total infiltration of the Mamaroneck trunk line sewers, which were designed by W. W. YOUNG, Consulting Engineer, New York City, for the Westchester County Sanitary Commission, is so much smaller than that allowed that the system will take care of many thousand more people than it was originally designed for.

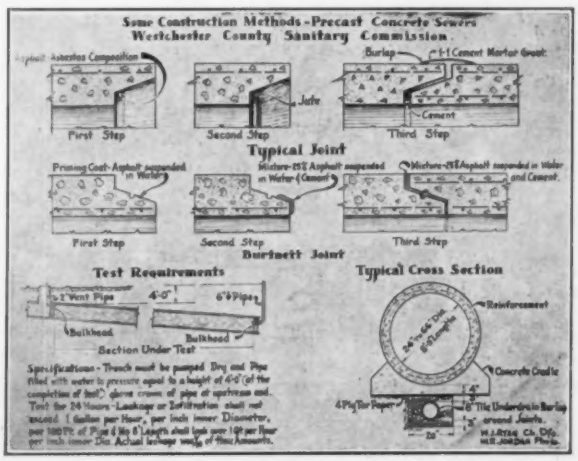
The trunk lines, for the most part, follow along the Mamaroneck River, Mamaroneck Reservoir, and Beaver Brook, crossing them at several points and being about 3 to 5 feet below the beds so that connections can be made under them from either side. As practically the entire line was far below ground water level the utmost care was taken to insure a permanent and tight line and to prevent seepage into the sewer.

A few of the sewers were built of cast iron pipe of from 14 to 24-inch diameter in 12-foot lengths, laid on crushed stone with a vitrified tile underdrain. A 40-pound air test was applied on all cast iron pipe, about 23,000 feet being used. Most of the sewers, however, were from 24 to 66 inches in diameter. On these, 8-foot lengths of reinforced precast concrete pipe were used, laid on a concrete cradle, with crushed stone and a vitrified tile underdrain under the cradle. For testing, a 4-foot internal head was placed on all concrete pipe before backfilling.

In making up the joints on the precast concrete pipe, a composition of asphalt and asbestos was first placed inside of the bell end of the pipe already in the trench; then a thick continuous strand of jute was packed into this compound; third, the spigot end of the next pipe was inserted into this bell and shoved home, the spigot end forcing the jute and sewer compound into the groove of the bell end; fourth, more jute was caulked into the joint, if needed. After this the remainder of the joint was filled tight from the inside with 1:1 mortar, a piece of burlap was placed around the outside and made tight, and then the outside of the joint was poured with a thin grout. The concrete cradle was placed before making up the joints, to prevent any settlement after the joints were made. To prevent the joints from cracking due to temperature changes, it was found desirable to place tar paper a foot or so above the pipe, allowing an air space, which helped considerably by keeping off the direct sun.

The specifications for leakage of the Westchester County Sanitary Commission are as follows: water shall be raised inside of the sewer barrel to give a pressure

(*Continued on page 75*)


Some Construction Methods - Precast Concrete Sewers
Westchester County Sanitary Commission.
Asphalt Asbestos Composition
Burlap
1:1 Cement Mortar Grout
Jute
Cement
First Step
Second Step
Third Step
Typical Joint
Priming Coat-Asphalt suspended in Water
Mixture-25% Asphalt suspended in Water (Cement)
Mixture-25% Asphalt suspended in Water and Cement.
First Step
Second Step
Third Step
Burnett Joint
Test Requirements
Typical Cross Section
2" Vent Pipe
4'-0"
6" Pipe
Bulkhead
Bulkhead
Section Under Test
Reinforcement
Concrete Cradle
4 Ply Tar Paper
6" Tile Underdrain in Burlap
Specifications - Trench must be pumped Dry and Pipe filled with water to pressure equal to a height of 4'-0" (at the completion of test) above crown of pipe at upstream end. Test for 24 Hours - Leakage or Infiltration shall not exceed 1 Gallon per Hour, per Inch inner Diameter, per 100 Ft. of Pipe (4 to 8' Length shall look upon 100 per Hour per Inch inner Dia. Actual leakage under all of these Amounts.

The Consulting Engineer

A Section of

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Walter F. Schulz, Memphis, Tenn., was a delegate representing the United States at the Fifteenth Permanent International Association of Navigation Congresses held in September at Venice, Italy, and presented a paper at the Congress. Among the projects under way in Mr. Schulz' office are the preparation of plans for river and rail terminals, plans and supervision of the construction of a grade separation project for Memphis, Tenn., and two steel car floats to be fabricated and launched at Pittsburgh for use at the river and rail terminals at Cairo, Ill.

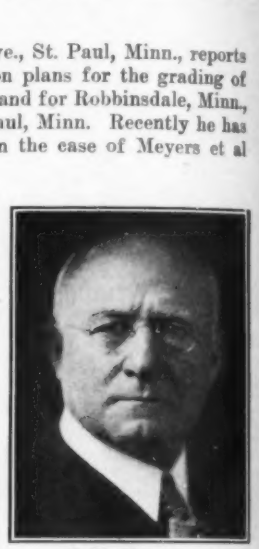
R. Husselman, 310 Hippodrome Bldg., Cleveland, Ohio, is engaged in the preparation of a gas report for the City of Elmira, N. Y., and of plans for plant extension for Willard, Ohio, and New Martinsville, W. Va. Recently Mr. Husselman acted as expert witness in rate cases for the Cities of Richmond and Bloomington, Ind. Mr. Husselman has recently been retained by Grove City and other boroughs in Pennsylvania in a gas matter before the Public Service Commission.

Consulting Briefs

Currie Engineering Co., 219 Andreson Bldg., San Bernardino, Calif., has announced the addition of L. E. Richardson to its staff. At present this company is working on a report on the sewage disposal at Laguna Beach, Calif., plans for sewage treatment, Signal Hill, Calif., sewers at Westmoreland, Calif., paving at Indio, Calif., and sewers and a sewage disposal plant at San Jacinto, Calif.

J. E. Carroll, 1682 Lincoln Ave., St. Paul, Minn., reports that he is at present working on plans for the grading of streets of West St. Paul, Minn., and for Robbinsdale, Minn., and sewer plans for West St. Paul, Minn. Recently he has been called as expert witness in the case of Meyers et al vs. Robbinsdale, Minn.

J. N. Chester Engineers, Clark Building, Pittsburgh, Pa., have recently been commissioned by the State Department of Property and Supplies to prepare plans for the addition to the sewage disposal plant at Polk, estimated to cost $57,000, and plans for a new power plant for the Western Penitentiary at Rockview, at an estimated cost of $90,000.



J. N. Chester

V. V. Long & Co., Nashville, Tenn., and Oklahoma City, Okla., are at present engaged in the preparation of plans for an electric light and power plant and water extensions for Pryor, Okla., and recently acted as expert witness in a pollution of water supply case for Okemah, Okla. The construction of an outfall sewer for Nichols Hills, Okla., water works for Livingston, Texas, and a power plant for Hominy, Okla., is being supervised by this firm.

S. F. Crecelius, San Benito, Texas, is preparing a report on flood control for the lower Rio Grande Valley for the branch office of the International Water Commission. It is expected that surveys of storage reservoirs will be started when work in the lower valley is completed.

George B. Gascoigne, 1140 Leader Bldg., Cleveland, Ohio, is working on plans for aeration and sludge settling tanks for the Easterly Sewage Treatment Works, Cleveland, Ohio, as well as supervising the construction of the Medina sewage treatment works. W. J. Tyler, R. T. Hornberger, E. G. Pocock, L. M. Wiegman and R. S. Jones have recently joined Mr. Gascoigne's staff.

William Archie Weldin, partner in the consulting firm of Blum, Weldin & Co., 417 Grant St., Pittsburgh, Penna., has been elected president of the Pitt Engineering Association, the alumni organization of the Schools of Engineering and Mines of the University of Pittsburgh.

H. L. Thackwell, Consulting Engineer, Jacksonville, Texas, is preparing plans for sewage disposal plants for Sulphur Springs, Henderson and Rusk, Texas, and for sewerage and paving for Longview, Texas. Mr. Thackwell has recently made appraisals on seven utilities for taxation at Rusk, Texas.

Camelback Water Conservation District

A VERY attractive booklet has recently been published, describing the purposes of the development of the Camelback Water Conservation District, the engineers for which are HOWARD S. REED AND SHELDON K. BAKER, Phoenix, Ariz. The District is located 11 miles northeast of Phoenix and is an integral part of the renowned Salt River Valley.

Plans for the development of this District into a citrus-growing area contemplate the procuring of the required water for agriculture and domestic use by means of eight deep wells to be drilled in the well-known water bearing gravels in the southeasterly portion of the District which has already been developed. Two wells of the District are already in operation. Motive power for these wells will be obtained by means of electrical energy obtained through contract with the Salt River Valley Water Users Association. Transmission lines will be located throughout the District for the purpose of distributing not only the necessary power to the wells but also to the resident owners of land for domestic purposes. All water will be carried in closed pipe lines and an analysis of the water from the two wells already installed indicates a high type of water, not only for agricultural purposes but for domestic use as well. The estimated cost of the project is $425,000.

Projects on Cape Cod

A REPORT from the office of GEORGE F. CLEMENTS, Old Post Office Bldg., Hyannis, Mass., states that he is now working on plans for dredging of the Yacht Basin for Hyannisport Civic Association, Hyannisport, Mass.; for the remodeling of the Old Bass River Savings Bank Bldg., South Yarmouth, Mass.; for assisting in work of the new $35,000 standpipe for the town of Provincetown, and a new $75,000 water system for the Town of Yarmouth, Mass. Plans are being made for a new $30,000 restaurant building in Hyannis, town maps prepared for Bridgewater, Eastham and Yarmouth, Mass., and street plans for the town of Yarmouth. Mr. Clements has been called as expert witness in many accident cases acting for individuals and companies such as the A.L.A. and the American Auto Insurance Co.

Under his supervision a $30,000 athletic field has just been completed for the town of Barnstable, a $45,000 estate for Alexander Finn, at South Hyannisport and the redesigning of a number of estates.

Who's Who in Engineering

AN outstanding service to the engineering profession has been made in the publication of the third edition of ***Who's Who in Engineering***. This biographical dictionary of leading engineers was edited by Winfield Scott Downs and published by the Lewis Historical Publishing Co., Inc., Eighth Ave. and 14th St., New York. The price is $10.00. By establishing an advisory committee of the American Engineering Council and a definite set of qualifications for those who would be included in the volume, it is now possible for anyone to establish quickly the position of an engineer and his experience through the brief biographical sketches. A geographical index arranged alphabetically by states and cities also adds to its value as a ready reference book.

Water Tower of Novel Design at Des Moines, Iowa

ACTING on the principle that the public works of a city should be pleasing to the eye of the public the Des Moines Board of Water Works Trustees have adopted a policy of beautifying the water works of their city. The new Allen Hazen water tower at Des Moines is an example of what may be done by combining architectural beauty with principles of utilitarianism. The tower is located on a 5-acre tract at a high point. Shrubs, flowers and trees will be planted around the tower and the whole will be made into an attractive park when construction is completed.

The tower was designed by HAZEN & EVERETT, Consulting Engineers of New York City and constructed by the Turner Construction Co., New York City.

The tower has a height of 94 feet from the top of the ground to the top of the tank shell and consists of a steel tank 110 feet in diameter and 30 feet high supported on 15 concrete columns 50 feet high. There is also a central shaft which helps to support the tank. This shaft consists of a concrete cylinder 50 feet in diameter and 18 inches thick. Within this cylinder is a smaller cylinder of concrete 9 feet 6 inches in diameter at the bottom and 14 feet in diameter at the top. A circular stairway from top to bottom is carried through the inner cylinder.

The foundation consists of 585 Raymond concrete piles designed to support 30 tons each. The whole superstructure contains 3,590 cubic yards of concrete and 175 tons of reinforcing steel. The weight of combined concrete and steel structure, together with the 2,000,000 gallons of water which it holds, amounts to about 19,000 tons. The tank alone weighs about 300 tons.

The tower was named for Allen Hazen, noted hydraulic engineer, who died in the summer of 1930, and who was a member of Hazen & Everett, the Consulting Engineers who designed the tower. Mr. Hazen was born in Hartford, Vt., on August 28, 1869, graduated from New Hampshire College in 1885 and from Massachusetts Institute of Technology in 1888. He began his career with the water department at Lawrence, Mass., and in 1904 entered the field of Consulting Engineering.

Small Infiltration of New Sewers

(Continued from page 73)

equivalent to a height of 4 feet above the exterior crown of the sewer at the upstream end of each section tested. Leakage from inside or infiltration from outside the concrete pipe sewer during a continuous 24-hour test shall not exceed a rate of one gallon per hour per inch of diameter of pipe per 100 feet of completed sewer and no joint or 8-foot length of pipe in the completed sewer shall leak an amount in excess of one quart per hour per inch of inner diameter.

The total infiltration allowed for the Mamaroneck trunk line sewers was over 725,000 gallons for 24 hours, while the actual infiltration showed a maximum of 86,000 gallons for 24 hours.

Credit for this feature of the work, the tightness of the sewers, belongs to the well qualified and efficient body of inspectors working under the able supervision of E. C. Hallock, Chief Inspector.

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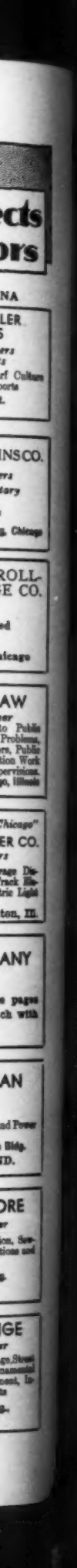


The Editor Comments—

What Is the Future of Tandem Pavers?

By speeding up the laying of concrete roads from an average of 1,200 feet per twelve-hour day to 2,000 feet in the same time, the tandem paver has done in road building what the assembly line did for the automobile industry. With a net increase of only 20 per cent in labor the tandem paver has brought about a 50 to 60 per cent increase in production. Minnesota and Iowa have been the testing grounds of the tandem paver idea this past summer. On the grounds of its failure to alleviate the unemployment situation, it is understood that Minnesota is to forbid the tandem paver in 1932. In Iowa the speedier paving seemed popular, but the reduced paving program of 1932 will probably mean fewer tandem pavers.

One contractor who had worked a part of the season with a single paver and then the second half with tandem pavers stated frankly that he could not reduce the cost per square foot of paving in the field with the tandem pavers. This organization had plenty of experience in the paving field and studied the tandem paver situation with a great deal of care before starting the second job as a tandem proposition.

The question that has arisen in our mind is that the technique of finishing the concrete behind the tandem mixers needs a great deal of study. With one paver and one finishing machine, the finishing machine is pushed up against the puddlers and produces results that we know very well. With the tandem pavers getting in so much more slab in the same time contractors have still pushed the finishing machine or machines right up against the puddlers and thus have been finishing a much wetter concrete than before. The answer to this seems to be holding the second machine back and finishing the slab at the same approximate time interval after the concrete was poured as when only one paver was used. On one contract we noted that the second machine was held uniformly about 40 feet behind the first machine with this very idea in mind.

The tandem paver, a typical Yankee idea of rushing everything, is naturally only an experiment this year and the results that are secured will be carefully scrutinized by the various highway departments and reported before such bodies as the Highway Division of the American Society of Civil Engineers and the American Road Builders' Association. They will be watched with a great deal of interest by all contractors.

One weakness of the tandem paver as I have seen it is the continual loss of grout from the batches as discharged from the first paver into the skip of the second. Grout is the essential part of the concrete as it contains the major part of the water and cement and loss of that continuously will tend to produce a weaker concrete. That this has not happened in practice is due to the large factor of safety in the cement proportions and to the possibility that the extra mix received by the concrete in dumping from the first paver into the skip of the second and from the skip to the second paver makes up for the slight loss. We might also mention that the problem of scattering the cement when loading the batches into the trucks has not by any means been solved with the present home-made or commercial bulk cement handling plants.

"The Contractor Must Familiarize Himself with the Site"

This phrase is a common one in specifications, particularly in building construction when reference is made to foundation construction. This identical phrase did appear in the specifications sent out by the office of a large mid-west architect to all foundation contractors who were asked to bid. In the case which has come to our attention the site of the new structure was at a considerable distance from the offices of the company which was considering bidding. Realizing the necessity of examining the site with reasonable care a man was sent to look it over.

The site was in the middle of an industrial section and had once been the site of a large factory. The ground surface presented the usual appearance of an empty lot with the expected accumulation of rubbish but nothing that could not be readily moved with a power shovel. The man, however, was not satisfied with the mere appearance of the site so went to a wrecking company with whom the contractor had had some dealings in the past on other jobs where wrecking and foundations for the new structure were carried on at the same time.

What a surprise! The wrecking company had demolished the original structure after a fire and the foundations of the first structure were still in the wreckage buried beneath 15 feet of debris which included reinforced concrete columns, radiators, the old basement floor and the footings of the original building. What a glorious surprise was awaiting the contractor who merely looked over the site and did not scratch beneath the surface. The contractor who did scratch put in a bid accordingly and was much underbid by one who merely "took a look" instead of taking pains to "familiarize" himself with the site.

Is not this a case too often practiced by architects in that they give too little study to their foundation problems for presentation of the conditions to prospective bidders, covering themselves at the same time by "saving clauses" in the writing of the contract? It is hardly thinkable that the ethics of the profession includes the hope that a legitimate construction cost to the owner will be reduced thereby at the expense of the successful low bidder through his "hard luck."

Theodore Reed Kendall

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Right to Extra Pay for Uncontemplated Difficulties

A HIGHWAY construction contract in the South called for construction under a plan showing a "present water level" at 58.3. But between the time of the survey, upon which the plan is based, and the letting of the contract a dam was constructed 2 or 3 miles down-stream, causing the water elevation to rise approximately 9 feet. The successful bidder overlooked that fact in looking over the job, the bid being based upon the showing made by the plan. This extra 9 feet of water materially increased the cost of construction and brings up the question of the contractor's right to extra pay. The highway authorities seemed to rely upon the contractor's supposed fault in failing to sufficiently examine the site, before making the bid.

If the specifications required bidders to examine the site and satisfy themselves as to existing conditions, that is apt to upset the contractor's chance of getting an extra allowance, for there are numerous decisions to the effect that where bidders are required to satisfy themselves as to the conditions of the site, etc., they are not entitled to rely upon a phase of a plan that is contrary to what a diligent examination of the site would have disclosed.

On the other hand, where bidders are not required to examine the site, the rule has been recognized by the highest court of the land (Christie v. United States, 237 U. S. 234) that where there is a deceptive representation in the specifications as to the material to be excavated which actually misleads the bidder who obtains the contract, and where it is admitted that time did not permit borings to be made by the bidder, to verify the representations, the bidder, on being awarded the contract in reliance upon the specifications, is entitled to reimbursement against extra cost resulting.

The fact that the plan in this case showed high water levels in three recent years reached elevations of 69.7, 73 and 81.2, respectively, and the presumption that bidders would understand that there might be a variation in the elevation between the making of the survey on which the plan was prepared and the award of the contract, would give special vitality to any clause in the specifications requiring the bidders to examine the site and satisfy themselves as to conditions existing. On the other hand, if the highway authorities knew that the plan did not truly represent the new normal water level, when bids were received, fairness manifestly required it to so notify bidders.

Among the latest court decisions, holding that bidders must know what a reasonably diligent examination of the site, required by the specifications, would disclose, is that handed down by the Texas Court of Civil Appeals in Hill v. City of Beaumont, 5 S. W. 2d, 590. There existence of a submerged log in the bottom of a river at the site of a construction job was a condition of which the contractor was presumed to know. The court said that the trouble encountered by the contractor, on account of the log, arose from a condition that would have been discovered had due examination of the site been made.

On the other hand, in the case James Stewart v. State, 201 N. Y. Supp. 334, it was decided that a contractor on a barge canal was entitled to relief against false estimates which the state's engineers knew were deceptive, and where the contractor had not had reasonable opportunity to explore the site.

In another case, decided just a little more than a year ago, the New Jersey Supreme Court refused to relieve a contractor on an ocean jetty job against false statements in the specifications as to soundings, partly because the contract expressly provided that the contractor must satisfy himself by soundings, etc., as to what work would be necessary, and partly because no complaint was made until the job had been completed. (Howland v. City of Asbury Park, 149 Atl. 115.)

Another point raised in the case in question was that excavation of a borrow pit to the grade elevation failed to produce sufficient earth for a fill, as contemplated. The engineer directed the contractor to go deeper into the pit, but that involved more expensive excavating methods. Is the contractor entitled to additional compensation?

In the light of well established legal principles, if the contract was awarded upon an express or implied representation by the highway authorities that excavation to the grade would yield sufficient dirt for the fill, and if the bidding specifications did not bind the contractor to make an independent investigation on that point, the claim seems to be a just one, unless barred by failure of the contractor to make any complaint until after the work was done. A standard legal authority says: "Where the necessity for extra work results from the acts, errors, and mistakes of the architect or engineer of the owner, under whose supervision the work is to be done, the loss should fall on the owner, and the builder may recover additional compensation." (9 Corpus Juris, 841-842.)

But if the contract or bidding specification charged the contractor with the duty of verifying the engineer's estimate or assumption, there is no valid claim, it would seem.

Directors' Liability

When one accepts a directorship in a contracting corporation, he accepts considerable legal responsibility. As shown by a recent decision of the Missouri Supreme Court, he may be held liable for losses due to negligent management of the affairs of the company.

But the liability for failure to discharge properly his duties as director accrues to the corporation, not to the stockholders in any direct sense. However, where the directors are the majority stockholders and therefore in control of the company, one or more minority stockholders may sue on behalf of the corporation to hold the guilty directors liable for the losses entailed by them.

Ordinarily, stockholders must attempt to secure redress through action at stockholders' meetings, or by application to the board of directors. It is only when such attempt would be futile, because the directors sought to be held responsible are in control of the corporate affairs, that it need not be resorted to before the complaining stockholders sue.

It is not to be understood from what is said above that directors are liable for all losses sustained by their action. They are not liable for honest errors in judgment, but only for fraud, carelessness, etc.

Note How the Broken Wires Protrude, With Jaggers as Sharp as Needles, in This Piece of Worn Out Wire Rope

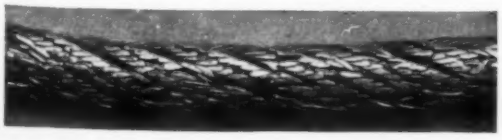
How Wire Rope Dies

THE way in which wire rope wears, shows surface breakage, and ultimately fails is well known to the many users of wire rope who have given the matter some study. The life and death of wire rope has been made the subject of considerable study by A. S. Rairden, Chief Engineer, American Cable Co., whose post-mortem on the specimens of worn rope illustrated has brought to light some very interesting information. The two ropes in the illustrations are not of exactly identical construction, nor do they show precisely the same degree of wear but they are sufficiently similar in both respects to bring out clearly certain differences in the two broad types of wire rope.

The first shows a rope that was laid up from straight strands which, in turn, were made from straight wires. The second illustrates a rope made by the preforming method in which the wires and strands, before assembly, are given a set to the precise form that they are to assume in the finished rope. The most conspicuous point of difference is the presence of protruding wires, called jaggers, in the first illustration. Their absence in the second illustration is explained by the fact that the preformed wires had no spring tension to force them out of their normal operating position and consequently nothing short of external forces could make them lift out of position when worn through or broken.

It is well known that wire, especially of the softer kinds, may be straightened by subjecting it to tension while freely suspended; also that it may be shaped by subjecting it to tension while holding it in the desired shape. Such straightening or shaping usually involves a stress slightly beyond the elastic limit but as a wire rope should never be given a working load of greater than 20 per cent of its ultimate strength, it will, if rightly treated, never as a whole be stressed beyond its elastic limit.

It is also true that varied stresses often repeated have a tendency to make material take a set that approaches the average or neutral position. This is illustrated in the spinning method of straightening wires of shafts. It might be expected that, in the course of a long life, the straight wires of a rope would have undergone enough tension, bending and perhaps torsion to bring them at least close to their operating position by the time a post-mortem examination is made. No doubt this effect occurs to some extent but that it is far from complete by the time the rope is worn out is evident from the jaggers in the first illustration. Indeed, it may be taken as mute testimony to the enduring elasticity of the metal from which modern cables are made. The same metals are used in preformed ropes such as that shown in the second illustration,



This Worn Piece of Preformed Wire Rope Illustrates How the Broken Individual Wires Stay in Position

but here the enduring elasticity, instead of making broken wires protrude, tends to restore them to proper position even if displaced by external force.

Close examination of the broken ends of wires in the first illustration shows them to be broken square across, with a flattened surface extending across the whole diameter of the wire. They have, on the surface exposed to view, the appearance of a tiny cold chisel. This is evidence that the wires failed by breakage when worn out more than half-way through. Normally this is fatigue breakage caused by concentration of strain at the point where wear has made the greatest reduction in cross section.

Similar examination of the second specimen shows that the preformed rope also is subject to breakage of wire at the point of smallest cross section but at a later stage of wear. In such wires as show a square-across break, the flattened surface has gone below the middle of the wire to a width less than the full diameter, so that these ends have the appearance of a screw-driver tip rather than a cold chisel. More of the wires in this second specimen, however, show an oval tip. Many, in fact, present a worn surface that is almost a perfect eclipse, indicating that wear has proceeded clear to the under side of a wire. The correct explanation is that breakage was postponed to a degree of wear somewhat greater than that of the first illustration and then—what was more significant—the rope was continued in service until the broken ends had been worn to a feather edge.

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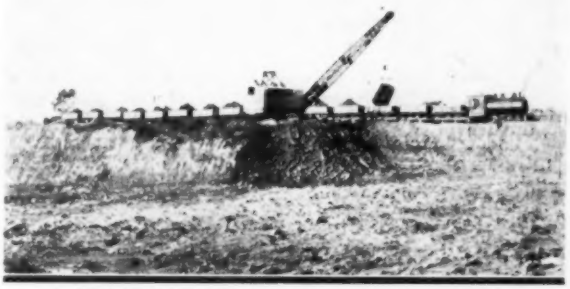


A Link-Belt Gasoline Crawler Dragline at Work Filling the 5-Yard Dump Cars

Making a One Million Yard Fill of Mucky Clay

THE new freight yard of Chicago, Burlington & Quincy Railroad at Galesburg, Ill., is notable for more than one reason. It is the largest freight yard in the world, consisting of between 200 and 250 miles of switch track, including 9 receiving tracks, 49 classification tracks, and 11 departure tracks. The second feature is the amount of fill required for the enlargement of the old yard. The land adjoining the old yard was at a considerably lower level and to use it meant filling with dirt from borrow pits, requiring approximately 1,000,000 cubic yards which for the most part was mucky clay.

Cameron Joyce & Co., Keokuk, Iowa, highway and railroad contractors, had the general contract and sublet the excavating and hauling work to L. A. Wilson & Co., Ottawa, Ill. The dirt for the fill had to be hauled for a mile to a mile and a half over temporary tracks from the pit to the site. Three Davenport saddle tank locomotives and forty-five Koppel and Western 5-yard dump cars were used, made up in three trains of from thirteen to seventeen cars. Working a single shift, this project was completed in four months. More than 197,000 yards of fill was handled by a single Link-Belt 2½-yard gasoline crawler dragline during this work. Two passes of the dragline filled the 5-yard cars and work was carried on without interruption throughout the rainy season.

Who's Who in Construction

A Series of Reports from Active Contractors

BUS. VOLUME—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $250,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

C. F. Swigert, President

Pacific Bridge Co., Portland, Ore., East Salmon Street. Branch office: San Francisco, Calif. Organized: 1869. Bus. vol. C. This company was organized in California in 1869 and in 1872 became incorporated in California and in 1925 incorporated in Oregon. It has always operated under the name of Pacific Bridge Co. Officers: C. F. Swigert, President; Philip Hart, Vice President; W. G. Swigert, Secretary and Treasurer. Major contracts: 1928, Harbor Wall, Portland, Ore., foundations, Longview Bridge, Longview, Wash.; 1929, foundations for Lake Union Bridge, Seattle, Wash.; 1930, pipe line water supply, Everett, Wash.; 1931, natural gas pipe line crossing Mississippi River, Muscatine, Iowa, Associate of Six Companies, Inc., Hoover Dam, Colorado River. Member: A.G.C.

Philip Hart, Vice President

The Joseph Neyer Inc., Cincinnati, Ohio, 1660 Central Ave. Organized: 1926. Bus. vol. C. Prior to 1926 this company existed as a partnership. Officers: Al Neyer, President and Treasurer; Richard Joyce, Secretary. Major contracts: 1928, St. Gregory Seminary, Cincinnati, $1,000,000; St. Louis Church, Cincinnati, $750,000; Third Memorial Church, Cincinnati, $160,000; Grace Episcopal Church; 1930, Eastern Garage and Board of Elections building.

John B. Orr, Inc., Miami, Fla., 147 N. E. 6th St. Branch office: Nassau, N. P., Bahamas. Organized: 1925. Bus. vol. B. This company started business in Miami, Fla., in 1911 under the name John B. Orr. It reorganized and incorporated December, 1925, under the name of John B. Orr, Inc. Officers: John B. Orr, President; Geo. E. Orr, Vice President; John McKie, Vice President; I. D. MacVicar, Secretary-Treasurer; C. C. Norman, Assistant Secretary-Treasurer. Major contracts: Surf Club at Miami Beach, Indian Creek Golf Club at Miami Beach, several residences in Nassau, N. P., and in Miami Beach, Fla. Member: A. G. C.

R. F. Wilson & Co., Chicago, Ill., 1851 Elston Ave. Organized: 1912. Bus. vol. B. Officers: R. F. Wilson, President; O. O. Carpenter, Vice President; L. M. Husak, Secretary and Treasurer. Major contracts: 1928 to 1930, Union League Building, Y. M. C. A. Building, Acme Steel Goods Co., five Continental Can Co. Buildings, Motor Ramp Garage Building, Northwest Tower Building, McCormick Y. M. C. A. Bldg., Mather Tower, three University of Chicago Buildings, Wabash Telephone Exchange, Franklin Telephone Exchange.

Dunlap & Co., Inc., Columbus, Ind., 5th & Jackson Sts., with branch offices: Edinburg, Hope and North Vernon, Ind. Organized: 1924. Bus. vol. C. This corporation is successor to Dunlap & Co., a partnership which was established in 1873, having been in the contracting business since the date of organization. Since the date of incorporation, 1924, it has specialized in U. S. Post Office construction and has built quite a number throughout the central and south central states. Officers: J. R. Dunlap, President; E. E. Dunlap, Vice President; W. D. Wooden, Secretary; L. B. Newby, Treasurer. Major contracts: U. S. Post Offices at Shelbyville, Ky., Richmond, Ind., Rushville, Ind., Lima, Ohio and a German Township School at Taylorsville, Ind. Member: Local and National Chamber of Commerce, Kiwanis and Rotary Clubs.

The Immick Co., Inc., Meriden, Conn., State St. Organized: 1916. Bus. vol. B. This company was incorporated in the State of Connecticut in 1916. Officers: H. D. Immick, Pres.; H. L. Immick, Vice Pres.; P. F. Fagan, Secy.; W. L. Immick, Treas. Major contracts: highway and bridge contracts in Connecticut and New York; industrial buildings in Connecticut; filling stations in Connecticut and New York. Member: A. G. C. of A.

Moline Paving & Const. Co., Moline, Ill., 1650 23rd Ave. Organized: 1927. Bus. vol. E. This company operated from 1911 to 1927 under the name of Edward Sheley and in 1927 the name was changed to the present one. It is operated under joint partnership of Edward Z. Sheley and J. E. Everett Sheley. Major contracts: paving and drainage work in the Cities of Aledo, Macomb and Table Grove, Ill.

G. A. Graham, Bakersfield, Calif., 613 19th St. Organized: 1927. Bus. vol. E. From 1920 to 1927, G. A. Graham was co-partner with J. H. Graham, operating under the name of Graham & Son in the San Joaquin Valley, Calif. They moved their office from Dinuba, Calif., to Bakersfield, Calif., in 1929. Officers: G. A. Graham, Owner; J. J. Graham, Supt. of Construction. Major contracts: 1927, Hospital Keene, Kern County, $40,000; Knudsen Creamery, Visalia, Calif., $25,000; school in Wasco, Calif., $30,000: 1928, Gymnasium, Delano, Calif., $75,000; S. P. Depot, Delano, $25,000; warehouse at Delano for fruit industries, $75,000: 1929, Conley School, Taft, $78,000; kindergarten, Ford City, $28,000; shop building at the Taft Union High School, $80,000: 1930, City plunge, Bakersfield, $10,000; junior college building for Bakersfield High School, $107,000; bridges and weirs for Buena Vista Water Storage District, $83,000. Member: Bakersfield Builders Exchange, President; Bakersfield Association of General Contractors, Vice President.

Trumbull Construction Co., Warren, Ohio, 407 Second National Bldg., with branch offices at Canton, Ohio. Organized: 1920. Bus. vol. E. Since its beginning this company has been owned solely by William M. Yount. It specializes in furnishing and applying bituminous material. In 1930, 25,000 gallons of this material were applied. Member: Ohio Contractors Association.

Construction Industry News

Bethlehem Steel Corp., New York City, has announced the acquisition of the properties and business of the Kalman Steel Co., fabricators and distributors of reinforcing steel, concrete accessories for buildings and roads, wire fabrics, steel, joists, door frames and metal lath. This business will be conducted by the Kalman Steel Corp., a Bethlehem subsidiary, with offices at Bethlehem, Penna. Officers in charge will be Paul Mackall, President; George E. Routh, Jr., Vice President in charge of sales, and R. E. McMath, Vice President and Secretary.

Universal Paper Bag Co., New Hope, Penna., has recently equipped its factory to manufacture Kraft multi-wall paper bags for the cement and pulverized rock products industries. E. T. Statler will be in charge of the Multi-Wall Paper Bag Sales Division.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has announced the appointment of W. A. Roberts as General Sales Manager and H. J. Yoakum as Industrial Sales Manager of the Tractor Division with headquarters at Milwaukee. Mr. Roberts was at one time Vice President of I. J. Haug & Son, Equipment Distributor, of Regina, Saskatchawan, and Mr. Yoakum was until recently District Manager of the Industrial Tractor Division in Ohio, Nebraska, Wisconsin and upper Michigan.

Sullivan Machinery Co., Chicago, Ill., has announced the appointment of Leon J. Cone as its District Manager at Duluth succeeding Jonathan A. Noyes, who has been promoted to Manager of the company's coal machinery sales division with headquarters at the general sales offices in Chicago.

Barber-Greene Co., Aurora, Ill., has announced the appointment of F. D. Hooper as General Sales Manager. Mr. Hooper was formerly Sales Manager of the Lidgerwood Manufacturing Company, of Elizabeth, N. J. He is a Cornell graduate and was employed by the Lackawanna Steel Co., now Bethlehem Steel, and the Boston & Maine Railroad before starting his 24 years of continuous service with Lidgerwood.

Gardner-Denver Co., Quincy, Ill., has announced the appointment of the Interstate Machinery & Supply Co., Omaha, Neb., as its agent in Omaha and vicinity.

R. G. LeTourneau, Inc., Stockton, Calif., has announced that Charles E. Cole, well known among contractors and equipment salesmen in California and Nevada, has joined its staff as factory representative.

Worthington Pump & Machinery Corp., Harrison, N. J., has announced the election of LaMonte J. Belnap as Chairman of the Executive Committee. Mr. Belnap is succeeded as President by Harry C. Beaver, formerly Vice President.

Independent Pneumatic Tool Co., Chicago, Ill., has announced the removal of its Birmingham, Alabama, office from the Comer Building to 915 N. Seventh Avenue, where warehouse facilities are available. H. F. Halbert is the local manager.

Acqua-Pruf, Inc., formerly of New York City, has recently announced a reorganization and the removal of its offices from 393 Seventh Ave., New York City, to 786 Broad St., Newark, N. J. The factory will, however, remain at Deal, N. J. The officers of this corporation now are Sidney T. Holt, President and General Manager; R. E. A. DeBow, Vice President and Factory Manager and Charles S. Hardy, Secretary and Treasurer.

Harnischfeger Corp., Milwaukee, Wis., has announced the appointment of Jay O. Ferch as Advertising Manager to succeed H. O. Strouse, who has been elected Treasurer of the firm.

Lidgerwood Manufacturing Co., Elizabeth, N. J., has announced the appointment of A. W. Boldebuck, formerly in charge of the Chicago office, as Sales Manager.

Distributors' Bulletin Board

The distributors of construction equipment listed below have made changes this month in their cards appearing in the Distributors' Directory on pages 105 *to* 131 *of this issue of* CONTRACTORS AND ENGINEERS MONTHLY:

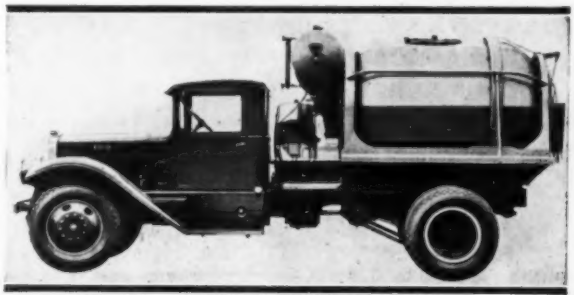
Hopkins-Osborn, Ltd., Montreal, Que.
Interstate Machinery & Supply Co., Omaha, Neb.
Neil B. McGinnis Co., Phoenix, Ariz.
Slade Tractor Co., Inc., Albany, N. Y.
J. H. Welch Co., Inc., Buffalo, N. Y.

A New Truck Mixer

A TRUCK mixer and an agitator for concrete, in which is incorporated a number of new features, has recently been announced by the National Equipment Corp., N. 30th St. & W. Concordia Ave., Milwaukee, Wis.

Among the features of this new Smith truck mixer are a thorough five-step mixing action, accomplished by clockwise rotation and without reversing the direction; an egg-shaped drum with a twelve-sided panel design; full control of the discharge, allowing for fast, slow or intermittent, as well as positive discharge without hoisting or tilting the drum; a separate power unit and roller and ball bearing drum support. This mixer is adaptable to any make of truck of sufficient capacity.

This unit is offered in two sizes. The 1½-cubic yard drum has a capacity of 1 cubic yard of resultant concrete as a mixer and 1½ cubic yards as an agitator. The 2 to 3-cubic yard mixer has a capacity in resultant concrete of 2½ cubic yards and of 3 cubic yards as an agitator. A third size, with a capacity up to 4½ cubic yards, will soon be available.



The New Smith Truck Mixer and Agitator

A Complete Bulk Cement Handling System for Highway Contractors

A COMPLETE bulk cement handling plant consisting of an adjustable steel frame 12 x 24 feet in size which contains a scale and three movable chutes which travel between two tracks carrying Turn-Lo cement carts, has been developed by the George O. Harm Co., Warren, Ohio.

After the cement carts are loaded in the cement car, they are brought to the correct weight on the scale and placed in position over the movable chutes. A steel apron which is attached to the bottom of the cart is dropped into the chute forming a continuous connection between the cart and the chute. This apron hooks into the chute in such a manner that when the cart is moved, the chute moves with it. When the batch truck stops beneath the charging platform, the carts and chutes are moved as units to the positions over the cement boxes and their contents discharged. The discharging is accomplished quickly and with a minimum of dust by turning over the revolving drum which carries the cement. With this system three batches of cement are always waiting for the truck when it arrives, and but one stop is necessary.

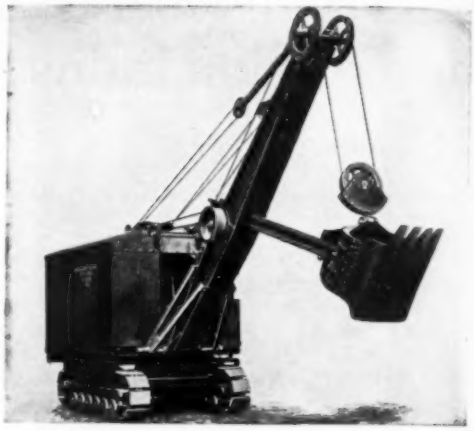
Discharging the Bulk Cement for Three Batches Simultaneously by the Turn-O-Matic System

The Turn-Lo cement carts are especially designed for this work. The top of the revolving drum is only 25 inches from the floor, so that the men do not lift the cement in loading and, since it does not drop far from their shovels, very little dust is created. The capacity of the drum is sufficient for a 7½-bag batch of cement.

This plant is usually operated by four men, one man to each cart on the charging floor and one man or a boy below to open and close the lids of the cement boxes on the truck. Sometimes another man is used to help load the carts in the car. With this system, contractors have handled between 500 and 600 barrels of cement per day with less effort than the handling of sacks.

A New ½-Yard Gas Shovel

A NEW ½-yard shovel, dragline, clamshell and crane, named Type 120, and designed for small general excavating and material handling work, has been announced by the Marion Steam Shovel Co., Marion, Ohio. This new model, according to the manufacturer, is constructed with the same engineering thought, the same quality of material and the same workmanship characteristic of all other



The New Marion Type 120 Excavator

Marion shovels.

The new machine moves rapidly. It is simple in construction and is thoroughly accessible with the fewest number of parts possible in its construction. It incorporates a number of new features, including a rotating gear as large as the overall width of the crawlers, centralized machinery mounting, a ball-bearing roller path, and high ground clearance combined with unusual compactness.

A Tractor-Mounted Mobile Crane

THE Travel-Crane, a quick-acting mobile crane made by Thaleg & Hock, Inc., 236 North Clark St., Chicago, Ill., was developed to meet the growing demand for a small crane that could be used to advantage where a large crane is not economically adapted.

The crane is mounted on a McCormick-Deering industrial tractor. The chassis is constructed of heavy steel, well braced and welded together for maximum strength. Equipment for the crane includes block and hook, magnet, clamshell, dragline, pile driver, shovel, rubber-tired wheels, crawler treads and full-circle dock crane. It has a travel speed of 1¼ to 6 miles per hour forward and 1½ miles per hour in reverse. The hoisting speed with a one-part line is 135 feet per minute, with a two-part line 67 feet per minute and with a three-part line 44 feet per minute.

It has a full-circle swing with a swinging speed of 5½ revolutions per minute and a nominal capacity of 3,000 pounds at a 15-foot radius or 6,000 pounds at 9 feet. It will handle a ½ or 1/3-cubic-yard clamshell bucket.

The Travel-Crane Powered by a McCormick-Deering Tractor

A Tractor-Mounted Brush Cutter

THE LaPlant-Choate cutter, designed for use with Caterpillar Sixty and Thirty tractors, is made by the La-Plant-Choate Manufacturing Co., Cedar Rapids, Iowa. The brush cutter for the Sixty has a cutting width of 12 feet while the cutter for the Thirty cuts a 9-foot swathe. According to the manufacturer, the Sixty has operated successfully in cutting soft poplar trees 18 inches in diameter, the size of the brush to be cut depending on the hardness and density of the wood. In brush and small timber, the Sixty is said to average from 10 to 12 acres a day.

The cutter itself is of the V-nose type, tending to push the brush and trees to one side, out of the path of the tractor. The cutting edge is also V-type, giving a slicing effect in cutting brush and trees and reducing the power required. The cutter is provided with three screw regulated shoes, one at the front and one on each side for regulating the cutting height of the cutter. Two long runners are provided for transporting the cutter from place to place. These are raised and lowered by a hand-operated hydraulic jack. The cutter is attached to the tractor by means of two central bars, one at the front and one at the rear.

The LaPlant-Choate Brush Cutter

Two large chains are fastened at the front of the V-nose by a grab hook for easy adjustment and run back to the brush cutter drawbar, forming a pullback chain for backing up. The front is guided by a scissors-hitch. The cutting edges are of crucible steel and are fastened to the bottom of the wedge-angle with heavy bolts. The blade, when it becomes dull or nicked, can be hammered out on a piece of heavy iron such as a railroad rail and then filed to sharpen it. The cutter can be mounted or dismounted by two men in 15 or 20 minutes.

A Ditch Dredger and Cleaner

A MACHINE which has a continuous-action chain excavator with patented automatic self-cleaning buckets for cutting and cleaning irrigation and drainage ditches is made by the Ruth Dredger Manufacturing Corp., Ltd., 5980 South Boyle Ave., Los Angeles, Calif. The power unit, a standard gasoline engine, as well as the elevator and bucket, are mounted on a single crawler unit which also carries the extension crawler which runs on the far side of the ditch to cut or clean. Telescoping pipes 8, 7 and 6 inches in diameter and of various lengths depending on the width of the canals are used to carry the extension crawler. A span of 16 feet center to center of crawlers or a minimum width of only 11 feet 8 inches are possible. The main crawler is only 24 inches wide and 12 feet long and the extension crawler 12 inches wide and 7 feet long.

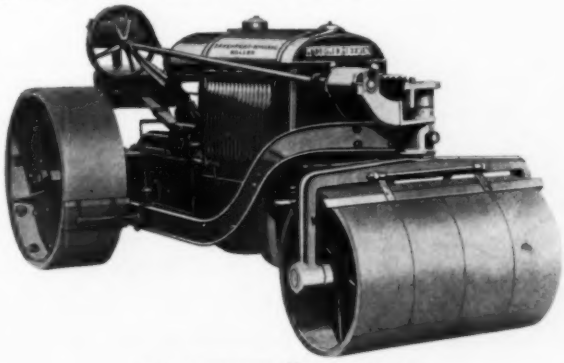
A Dredger for Canal and Irrigation Work

The Model H Type O Ruth dredger has a selected type transmission with four forward digging speeds, four forward road speeds and two in reverse, and two elevator digging speeds as well. With a motor speed of 1,050 rpm, the elevator digging speeds are 15 buckets per minute and in second, 30 buckets per minute. The forward traction speeds are, respectively, 4, 8, 15 and 20 feet per minute. The capacity of the machine is approximately 1,500 cubic yards per 10-hour day. There are positive clutches on the crawlers for steering and the turning radius of the machine is approximately 11 feet.

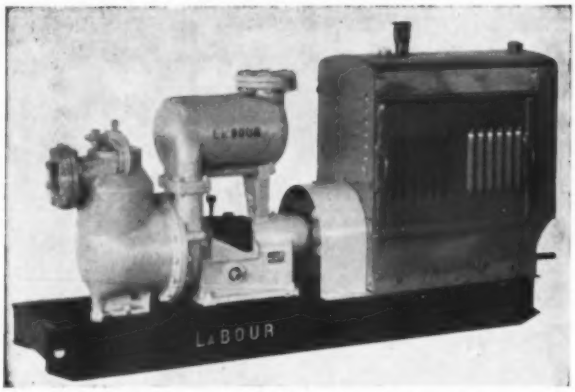
A Tractor-Powered Roller

THE Davenport-Winchell roller, made by the Davenport Locomotive & Manufacturing Corp., Davenport, Iowa, is an all-purpose unit combining the desirable features of low initial cost, dependability and unusual operating economy. The roller is furnished complete with power plant or the roller equipment may be obtained separately and readily attached to a McCormick-Deering Model 20 tractor. This feature makes the roller especially economical for those who require a roller at intermittent periods, yet whose needs are not so constant as to justify investment in a single-purpose machine. It is well adapted for road and street work, parks, golf courses and similar uses.

The roller has a wheelbase of 9 feet 4 inches. Without wheel weights it weighs 3¾ tons, with small weights 4¼ tons, and with large weights 5¼ tons. It has three speeds forward and one reverse and an improved side cranking device is provided for safe and easy starting. The front roller is 2 feet 4 inches in diameter by 3 feet 6 inches wide, and the rear wheels 3 feet 6 inches in diameter and 1 foot 3 inches wide. The rear wheels lapping under the front roller by 2½ inches give an overall width of 5 feet 7 inches.



The Davenport-Winchell Roller



A Rugged 750-gpm Centrifugal for Low Head Work

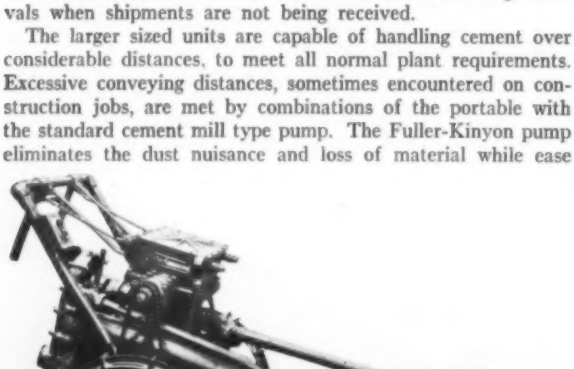
A 750-GPM Centrifugal Pump

A SKID-MOUNTED or portable centrifugal pump direct-connected to a Buda H-199 engine and known as the No. 40 Type DPL pump has been announced by the LaBour Co., Inc., Elkhart, Ind. This pump is ruggedly designed and constructed for low head work and is efficient. For contractor's service these pumps are made in cast iron with special alloy steel impellers to resist wear when pumping water containing considerable grit.

Portable Systems for Handling Bulk Cement

A PORTABLE pumping system particularly designed to unload bulk cement from standard box cars, and deep-draft and houseboat type cement barges, has been developed by the Fuller Co., Catasauqua, Penna. This Fuller-Kinyon system is usually arranged to deliver directly from cars or boats to the mixer or to storage bins. One of the outstanding advantages of this portable equipment is the possibility of eliminating expensive overhead storage bins or silos, as simple flat-bottom warehouses of cheap construction form a convenient storage. The same unit and system serve to recover cement from the bins or warehouses during intervals when shipments are not being received.

The larger sized units are capable of handling cement over considerable distances, to meet all normal plant requirements. Excessive conveying distances, sometimes encountered on construction jobs, are met by combinations of the portable with the standard cement mill type pump. The Fuller-Kinyon pump eliminates the dust nuisance and loss of material while ease of installation and operation and complete portability of the unit and system from one construction job to another, makes added economy possible.



The Fuller-Kinyon Type B Pump for Handling Bulk Cement

The system comprises a portable pump, either type A or type B, the first being used for 1-yard mixers including highway pavers and small products plants and the second pump where larger mixers are used and over long conveying distances. With the pump is used sufficient flexible transport hose to connect with a small diameter steel pipe line leading to the various bins. The flow of cement through branch lines to the mixer or storage bins is controlled by two-way or three-way diverting valves. A source of compressed air is necessary for the operation of the pump.

A perforated disc feeder, rotating at a relatively slow speed, delivers the cement to the barrel of the pump through which it is advanced by an impeller screw, driven by a built-in motor. The mounting of this motor is of special design, but the electrical parts are standard. Beyond the terminal flight of the screw, a small quantity of compressed air is admitted through a number of small ports. This air creates a fluent or artificial flooding condition, so that the cement will be forced through the transport line by the introduction of new material by the screw.

Model T Wood Hydraulic Threeway Dumping Unit on a 2½-ton Roadbuilder Chassis

New Side and Rear-Dump Trucks

THE new Wood Threeway hoist and body dumping unit for any size and type of truck chassis, is made by the Wood Hydraulic Hoist & Body Co., Detroit, Mich. The light, strong all-steel construction of the hoist and body of the new unit gives minimum dead weight with greater truck earning capacity, while the simple design and sturdy construction make the unit practically fool-proof and able to withstand abuse and severe service. The new electrically welded sub-frame design of the body gives great strength and durability to the unit.

The hoist itself is of the single unit hydraulic type, consisting of a 4-section telescopic cylinder with the oil pump and reserve tank built in as part of the complete hoist assembly. It applies lifting power direct to the body-center and, being mounted on double-oscillating trunnions at top and bottom, the telescoping cylinder gives a direct-line hoist thrust at all times. The cylinder sections are of special wrought steel, the double-wall of the cylinder serving as the return channel for oil after the maximum hoisting height is reached, so that there is no danger of over-pressure. The hoist operates while the truck is moving or standing, as required for spreading materials and a Wood ball check pump holds the body at any angle in any position.

How to Make Your Shovel-Crane-Dragline Last Longer

By
G. H. Olson

Link-Belt Co., Chicago, Ill.

IN the operation of a shovel-crane-dragline powered by an internal combustion engine, there are five things which will materially prolong the life of the machine, increase its efficiency and reduce its maintenance cost. Cut the following suggestions from this magazine and have your operator paste it in the cab of your machine.

1. *Cleanliness.* Keep your machine and its parts clean and well painted. It will inspire pride in your machine and make it easier to care for.

2. *Good Fuel.* Use good fuel and keep it perfectly clean. It will increase the life of your engine and give a more dependable power plant for your work. Do not permit fuel to be stored or handled in any way that is liable to introduce water, dirt or other foreign matter.

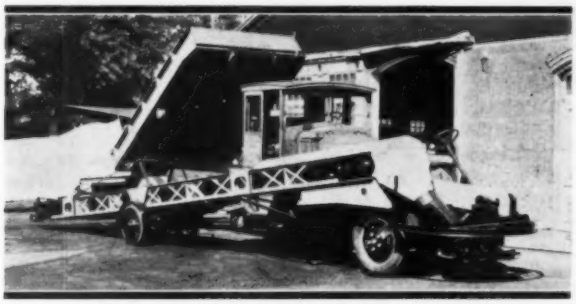
3. *Lubrication.* Lubricate the machine properly, using the correct grade and kind of lubricant for each requirement. Lubricate often enough and carefully, but at the same time, wipe off any excess oil or grease, as otherwise dirt will cling to it. Depending upon the amount of service the machine is called upon to perform, regulate the lubrication periods. Don't try to stretch the intervals by putting on twice as much oil or grease at one time. If you don't have a lubrication chart, write to the manufacturer of the machine for one.

4. *Mishandling.* Exercise care in handling the machine. Don't abuse or break it up by abnormal operation, when a little care will avoid it. In shovel work, don't try to move a whole mountain in one dipper full, but strike the proper combination of cutting depth and height and maintain it. It will be easier on the operator, easier on the shovel, and more yards of excavation will be moved at the end of the day. In rock or other very hard excavating, use powder to break it up to such size that the shovel can conveniently handle it.

5. *General Care.* Maintain regular habits in caring for your machine. The machine will more than repay you for the attention by not failing you at the most important time when you are rushed to turn out a particular piece of work. By regular examination of your machine, you will know when a certain part is wearing to a point where it is safest to replace it or have a spare part on hand.

A New Sand and Gravel Spreader

THE Reliance sand and gravel spreader which spreads fine or coarse sand or sand and gravel dry or as it comes from the bank to cover oil, ice or build sand and gravel highways has recently been announced by the Universal Road Machinery Co., Kingston, N. Y. The amount of material applied, the width and depth of the spread and the direction of travel are under the operator's control from a seat conveniently located at the head end where he can observe closely the work being done. This machine spreads a heavy cover of from 8 to 12 feet or sands any width up to 30 feet. The material is placed ahead of the spreader and truck, so that they are both always traveling on covered surface. While the capacity depends largely on the type of coverage required, the Reliance spreader will handle up to 60 tons an hour. When spreading heavy cover, it operates at 5 or 6 miles per hour and when sanding at 10 to 15 miles per hour.



The New Reliance Sand and Gravel Spreader

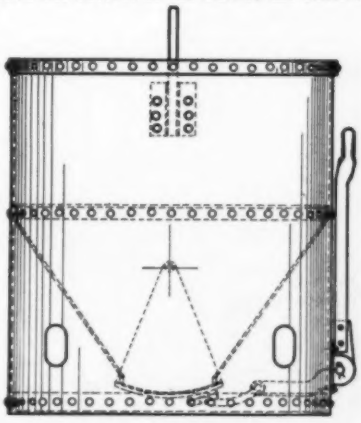
The spreader consists of a short and long conveyor, together with a revolving disc working in unison. The short conveyor is pivoted at the foot of the long conveyor and can swing out to permit the loaded dump truck to be attached after which it swings back of and is attached to the rear of the truck chassis. At the head of the long conveyor is an adjustable chute which carries the material down to a circular distributor with selective speeds, this distributor providing adjustments to meet the varying conditions of material and coverage. The spreader has its own independent power unit which operates the spreading mechanism as well as the two belt conveyors, three gear ratios being provided. Motive power is supplied by the truck.

The Reliance spreader can be operated with any standard dump truck. With the body of the truck elevated to dumping position, the material is delivered to the short cross conveyor, passes to the long conveyor and thence to the distributor.

A New Concrete Bucket

A CONCRETE bucket equipped with a single radial gate which cuts off cleanly and makes it possible to pour into narrow forms and columns without dripping, has been announced by the Dayton Whirley Co., Dayton, Ohio. The Wiley concrete bucket is cylindrical in shape and is made in 18, 33 and 63-cubic foot capacities or larger to order.

The bucket contains a false bottom which is tapered at a sharp angle to permit ready flow of the concrete. The radial gate is operated by hand, the power of the hand lever being multiplied 20 times when starting or "breaking open" the gate due to the toggle action of the lever and link. This power is reduced to three to one after the gate is partly open. As the radial gate is slightly above the bottom of the bucket the bucket can be used as a floor hopper, or when suspended above the floor can be used for loading buggies, wheelbarrows or discharging into chutes. Because of its cylindrical shape the bucket can be rolled from place to place by one man. The bale is riveted to the inside of the bucket. Convenient hand holes in the outside shell of the bucket permit ready handling by men on the forms.



END VIEW

Mechanical Equipment for Building Low Cost Roads

HIGHWAY engineers and the general public are at the present time very much interested in low cost type of roads for the extensive farm to market secondary system. In the early days of concrete construction the costs were perhaps 50 per cent higher than the cost of present day concrete roads of approximately the same thickness of slab. The great reduction of cost in concrete roads is due to the high degree of efficiency which was developed by highway engineers in cooperation with the equipment manufacturers.

Low cost type of roads in the past have not been built with special equipment developed for that purpose as engineers and equipment manufacturers have not given this subject very much consideration. The Heltzel Steel Form & Iron Co., Warren, Ohio, has developed what is known as the Heltzel trailing macadam form which is aimed to speed up the construction of the macadam type of low cost roads.

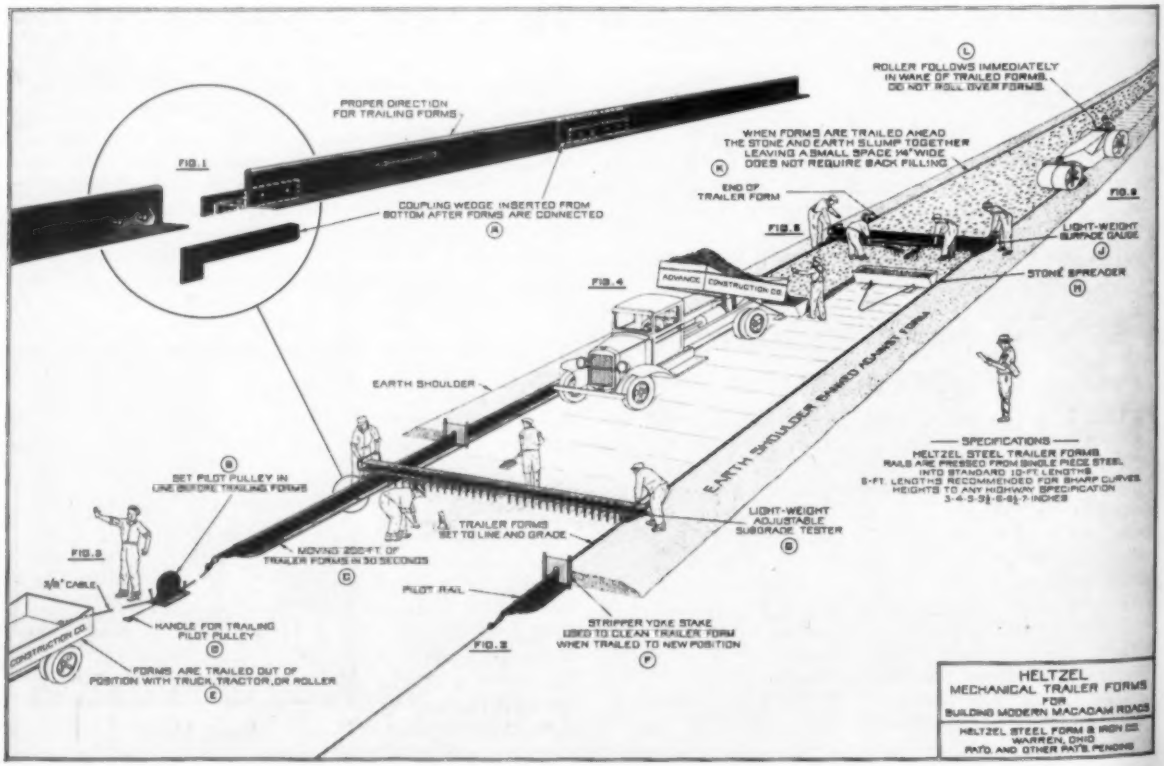
Figure 1 shows a section of this form and the method of connecting the 10-foot sections together making a train of forms approximately 200 feet long, trailed as shown in Figure 2. B shows the pulley block through which a ⅜-inch cable passes and is attached to the truck E for trailing ahead as shown connected to the pilot form C. The forms are set to line and grade and the subgrade template G is used for gaging the subbase. This template is made as light as possible to permit the passage of the motor trucks for delivering the stone aggregate. The earth shoulders are thrown up against the outside of the forms, and are shown by Figure 4. The stone is dumped on the subgrade in the usual manner and spread by the stone spreader H.

At F it will be noted that the steel stripper stake is used to guide the form, but a more important object of this stripper stake is to clean the form and to prevent dragging of the earth shoulder. Usually but one stripper stake is required, which is placed ahead of the forward end of the form set-up as indicated.

In Figure 5 at J, it will be noted that there is a light surface gage which is moved over the top of the stone to level it down to the proper elevation and crown. At K the forms have been trailed ahead by the motor truck as described at C, D and E, and after the trailer forms have been moved ahead, the roller L is then run over the roadway with the rolls overlapping the earth shoulder as indicated at L. Approximately ½ minute is required to trail 200 linear feet of these forms 100 feet ahead. These Heltzel trailing macadam forms have been used quite extensively in Ohio and some contractors claim that they save as high as $20.00 per day on their macadam work.

A New Intermediate Tractor

ANOTHER member of the Caterpillar tractor family, the Caterpillar Fifty tractor, has been announced by the Caterpillar Tractor Co., Peoria, Ill. Between the Thirty and the Sixty in size it fills a gap in the power range. It develops fifty maximum drawbar horsepower and its shipping weight is approximately 16,500 pounds. In general appearance the Fifty follows in the lines of design of the three smallest sizes in the Caterpillar tractor line; the hood enclosure for the engine, fuel tank just behind the engine, a wide cushioned seat for the driver and all controls conveniently placed and within easy reach. There are four speeds forward and one in reverse. The speeds in miles per hour are first 1.6, second 2.4, third 3.4, fourth 4.7 and reverse 1.9. The area of ground contact with standard track shoes is 2,456 square inches. The tractor measures 146¼ inches in length, 75¾ inches in height and 78⅞ inches wide. The ground clearance measured from the lower face of the standard track shoe is 11¼ inches. The drawbar is located 15½ inches above the ground. The lateral movement of the drawbar, measured at the pin, is 25½ inches. The Caterpillar Fifty is equipped with a 65-gallon fuel tank. The engine is a 4-cylinder, 4-cycle, water-cooled, valve-in-head unit with a 5½-inch bore and 6½-inch stroke and operates at 850 rpm.


PROPER DIRECTION FOR TRAILING FORMS
FIG. 1
COUPLING WEDGE INSERTED FROM BOTTOM AFTER FORMS ARE CONNECTED
A
ROLLER FOLLOWS IMMEDIATELY IN WAKE OF TRAILED FORMS. DO NOT ROLL OVER FORMS.
L
WHEN FORMS ARE TRAILED AHEAD THE STONE AND EARTH SLUMP TOGETHER LEAVING A SMALL SPACE ½" WIDE DOES NOT REQUIRE BACK FILLING
K
END OF TRAILER FORM
FIG. 6
FIG. 9
LIGHT-WEIGHT SURFACE GAUGE
J
FIG. 4
ADVANCE CONSTRUCTION CO.
STONE SPREADER
H
EARTH SHOULDER
EARTH SHOULDER BANKED AGAINST FORMS
SET PILOT PULLEY IN LINE BEFORE TRAILING FORMS
B
FIG. 5
⅜" CABLE
TRAILER FORMS SET TO LINE AND GRADE
MOVING 200 FT. OF TRAILER FORMS IN 30 SECONDS
C
LIGHT-WEIGHT ADJUSTABLE SUBGRADE TESTER
G
PILOT RAIL
HANDLE FOR TRAILING PILOT PULLEY
D
CONSTRUCTION CO.
FORMS ARE TRAILED OUT OF POSITION WITH TRUCK, TRACTOR, OR ROLLER
E
FIG. 8
STRIPPER YOKE STAKE USED TO CLEAN TRAILER FORM WHEN TRAILED TO NEW POSITION
F
SPECIFICATIONS
HELTZEL STEEL TRAILER FORMS RAILS ARE PRESSED FROM SINGLE PIECE STEEL INTO STANDARD 10-FT. LENGTHS
8-FT. LENGTHS RECOMMENDED FOR SHARP CURVES.
HEIGHTS TO ANY HIGHWAY SPECIFICATION
3-4-5-3½-6-6½-7 INCHES
HELTZEL
MECHANICAL TRAILER FORMS
FOR
BUILDING MODERN MACADAM ROADS
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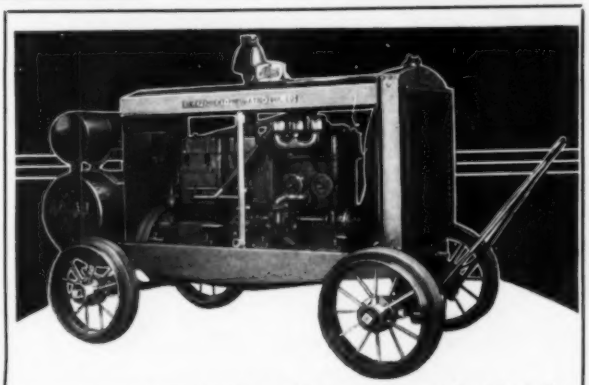


A compressor is purchased for only one reason—to furnish air for the operation of pneumatic tools. Isn't it logical to assume then, that the compressor that delivers the most air, dollar for dollar, size for size, is the compressor to buy? Because of the Super-Charger, THOR COMPRESSORS deliver 26 per cent more working air than any other compressors of the same size. The direct-connected construction also saves you money. Write for catalog No. 104 which explains it in detail.

INDEPENDENT PNEUMATIC TOOL CO.

248 So. Jefferson Street Chicago, Ill.

Thor "6" AIR COMPRESSOR

Improvement Designed to Guard Against Obsolescence in Truck Mixers

THE rapid march of progress in the ready-mixed concrete business together with the new methods of handling concrete, of selling the mixed batch and of financing concrete factories and the belief that equipment designed for today must be planned to pay its way profitably for the next several years has resulted in the development of several improvements in Rex Moto-Mixers by the Chain Belt Co., Milwaukee, Wis.

One of the improvements on the Moto-Mixer is the method by which the entire batch can be discharged regardless of the angle of the truck which has delivered the mixed batch to the job. Conditions around a contracting job do not always permit unloading a truck on the level but the Moto-Mixer is so designed that the mixed concrete may be discharged even though the incline is very steep.

Another feature is the new controlled discharge by which the operator can control the flow of the concrete at will. At a single turn of the hand wheel the concrete can be rushed out at full speed or turned down to a mere trickle. A new spout is also used to help place the mixed concrete with greater efficiency

The Improved Rex Moto-Mixer

in the forms. Other improvements are the water control mechanism, heat-treated steel reduction gears, enclosed in a bell housing and operating in a constant bath of oil. The mixer is lighter and lower than the previous models, with separate mounting, and can be used on any truck or trailer.

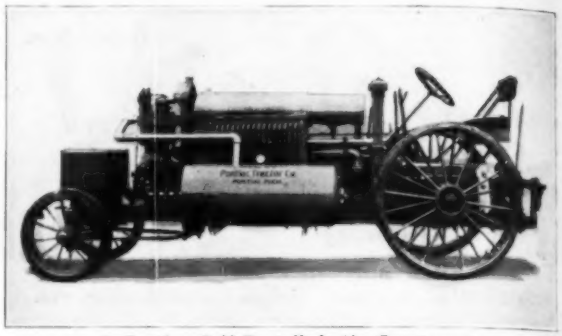
A Self-Propelled Air Compressor

A SELF-PROPELLED four-wheel air compressor capable of hauling other equipment behind itself and moving to, from and ahead on the job under its own power, is made by the Pontiac Tractor Co., Pontiac, Mich.

Power is taken from the tractor to drive the Quincy W-4 duplex, single-stage water-cooled compressor through the power take-off pulley which has a clutch allowing it to be thrown in or out of gear at will. The forward drive brings the belt tightener into the correct relation with the belt.

The Pontiac backfiller winch is mounted on the frame at the side of the tractor and takes its drive through a chain from the power drive-shaft at the rear. It is a single-drum type winch with clutch and brake and is operated from the driver's seat by a lever. The compressor and the winch can be operated separately or together which permits backfilling and tamping at the same time.

A separate radiator with pump-driven circulation is mounted for the compressor, insuring air at low temperatures from the compressor and adding to the efficiency of the machine.



A Pontiac Self-Propelled Air Compressor

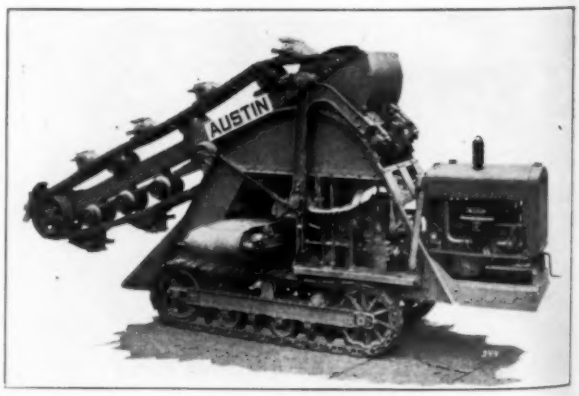
The compressor has a three-bearing crankshaft and a force-feed oil system to all bearings which permits the machine to be operated without jacking it to level. A large air receiver allows an even flow of air to the tools at all times. The unit is controlled by a Penn unloader with hand unloader attachment. The capacity of the unit is two busters, four spades, four riveters or two tampers. The power plant is a McCormick-Deering Model 20 industrial tractor.

A Ditcher for Water, Sewer, Pipe Line and Conduit Trenches

THE Austin Model 90 ditcher, a small, compact and rugged machine designed to dig water, sewer, pipe line and conduit trenches up to 8 feet deep and 12 to 32 inches wide, is manufactured by the Austin Machinery Corp., Muskegon, Mich.

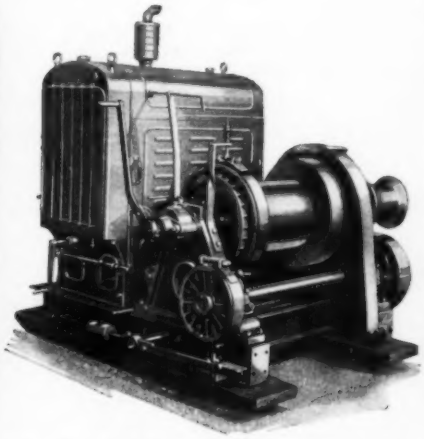
The entire main machinery unit is enclosed in a case and runs in oil. All gears are high carbon steel cut from solid blanks, and the shafts are of manganese alloy steel turned and ground to an accurate finish. All important clutches, including the engine, traction, excavator drive, boom hoist and feed are of the heavy-duty twin disc gear type. The boom hoist consists of a self-locking worm drive with a friction type twin disc hoist clutch and has a boom locking control which maintains the trench grade. The machine is powered by a heavy-duty 4-cylinder motor.

Six digging speeds are available with changing sprockets, and two speeds are provided as standard equipment for the traction, bucket line and conveyor. The sturdily built box girder type boom telescopes and is adjustable to the desired digging depth. The boom can be offset to dig in any position across the back frame and will dig 14 inches from obstructions on either side of the machine.



The Model 90 Ditcher

A Hoist Built - - - - - - - As You Would Build It



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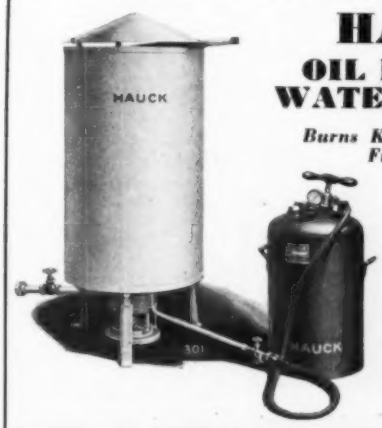

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No "steam" troubles to cause cold water periods.

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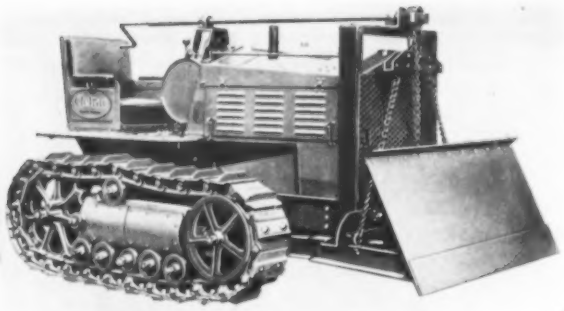


The Hall Bulldozer Mounted on a Cletrac

A Mechanical Lift Bulldozer for Small Tractor

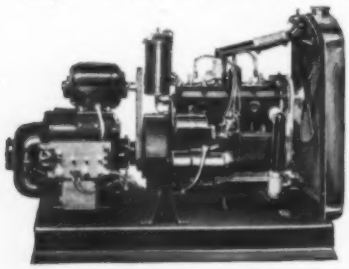
THE Hall mechanical lift bulldozer for use with the Cletrac 15 tractor is manufactured by the Essex Tractor Co., 448 Washington Ave., Belleville, N. J. Its blade is 53 inches wide by 24 inches high of ¼-inch plate with a cutting edge ⅜-inch x 6 inches. The push bars are of 4-inch I beams. It has a lift range of 10 inches above grade and 4 inches below grade and a raising rate of 1 inch per turn of the hand crank. The radiator is guarded by a perforated plate and the raising shaft is equipped with grease-packed dustproof self-aligning ball bearings.

This bulldozer centralizes the blade load on the tractor and the thrust from the loaded blade passes close to the center of gravity of the tractor. The lifting mechanism is simple, rapid, easy and accurately controlled and the operator's view of the work is unobstructed.

Larger Alternating Current Electric Plants

A LINE of alternating current plants in sizes from 2 to 10 kw has been announced by D. W. Onan & Sons, 308 Royalston Avenue, Minneapolis, Minn. These plants furnish alternating current at either 110 or 220 volts, 60 cycle. They are particularly adapted for use in construction camps and for construction work as they will furnish a bright steady light or power for any kind of electrical appliances that can be used on a conventional city service, eliminating special direct current or low voltage appliances. The plant consists of a four-cylinder gasoline engine, with alternating current generator, mounted on a steel base and assembled in unit construction. The engine is water cooled with a radiator and thermal circulation. Lubrication is force feed through the crank bearings with a large reservoir for constant supply. A pressure gage is provided to check the oil which is fed at 40 pounds pressure to all bearings through an oil filter.

The generator is of the revolving field type. It is driven through a rubber disc flexible coupling with a separate direct current exciter. The plant is so arranged that each unit is separate and complete, making the assembly standard and using only such equipment as have proved reliable in the automotive and electrical industry. The voltage is regulated electrically at the carburetor and constant voltage is maintained regardless of the load being handled. The starting system used consists of a 6-volt battery and motor with the conventional Bendix drive. The battery is recharged by the direct current exciter. Starting is handled through a remote control system, the stations for which may be located at any convenient places.



The Onan A.C. Electric Plant

These plants are used on dredges, steam shovels and for illumination of construction camps and construction work. The plants are built so as to operate in multiple, carrying larger loads with two plants when necessary.

A Heavy-Duty Hydraulic Scraper

THE Shaw heavy-duty scraper, which is simple in construction, consisting of two heavy wheels supporting a frame, the frame in turn supporting a bucket and a hydraulic jack on each side of the bucket to raise or lower it, is manufactured by the Shaw Excavator & Tools Co., Worthington, Ohio. This scraper, which is one-man-operated, loads natural soils without plowing or rooting in low speeds and travels, dumps and spreads in high speed. It is readily backed and dumps and spreads in backward motion, or it may be backed and the entire load dumped over an embankment. It is made in two sizes, a 4-yard level capacity for use with large tractors and a 2¼-yard level capacity for medium tractors.

A Shaw One-Man-Operated Scraper

The bucket of the Shaw is composed of two sides and a bottom. The nose of the bottom is of high carbon steel, double edged and reversible. The back plate serves as a rear of the bucket and also as the leveler when the front end of the bucket has been raised to discharge the load. The bucket being hung from the top rear corners automatically forces the cutting edge into the ground whenever it is lowered. On each side of the bucket is placed a telescopic type hydraulic cylinder which is controlled by one lever at the driver's seat. The pump is operating continuously and the raising or lowering of the bucket is accomplished without stopping or changing gears.

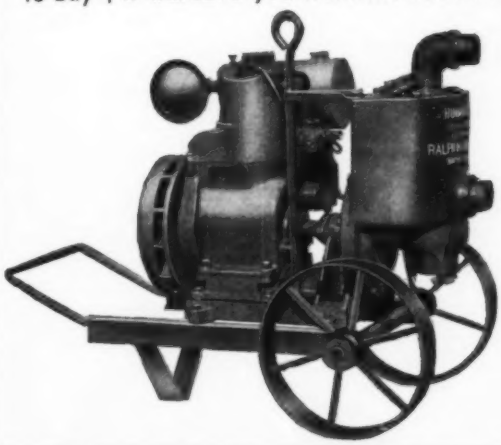
In filling the scraper, the operator of the tractor drops the front end of the bucket on the ground and moves forward. The cutting edge digs in the regulated depth and from there cuts the earth which is forced into the bucket. When the bucket is loaded the front end is raised so that the bottom is about level and about 8 inches from the ground. At this point the cutting edge comes very near the stationary plate in front while the rear plate fully encloses the entire back of the bucket. To dump, the operator causes the cutting edge to be raised so that the bottom is at about a 70-degree angle while moving. The contents fall out and are spread evenly by the rear plate passing over it. However, this rear plate is hinged and may be permitted to swing if spreading is not desired or to permit the discharge of boulders or other débris. The bottom of the bucket acts as a spreader in backward motion.

Don't be put on the SPOT!

Are you going to be taken for a ride?

"Old Man Average," bugaboo of contractors who buy cheap equipment, will take you, but before he does, he'll make you pay much more than your original cost in repairs and shut-downs, perhaps the difference between profit and loss.

Protect yourself with a HUMDINGER. Even though it costs you a little more to buy*, it will save you from the racket by getting rid of more water in less time with lower operating and maintenance costs.



* HUMDINGER prices are consistent with today's greater dollar value. They have not, however, been sacrificed to the racket by eliminating internal construction, not apparent ,but vital to satisfactory performance in any pump—and they won't!

Humdinger Pumps are manufactured in all types and sizes. Self-priming, centrifugal pumps from 2" to 8" with capacities ranging up to 2,000 G.P.M.

Pump illustrated 2" size

Write for Booklet "A Way to Save Money on Your Next Wet Job."

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Style JJ-1 Oil-Burning Heater, 210 gallons

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A New Stockpile Loader

The New Model 50 Stockpile Loader

TO meet the requirements of many stockpile loading jobs which do not need a standard sized loader, the Geo. Haiss Mfg. Co., 142nd St. and Park Ave., New York City, has recently brought out a loader designed for average stockpile loading requirements. This new Haiss Model 50 is built with the same strength and quality of material throughout as the larger Haiss models. It has a capacity of from 1½ to 1¾ cubic yards per minute, handling materials in lumps not larger than 6 inches and weighing not more than 125 pounds per cubic foot.

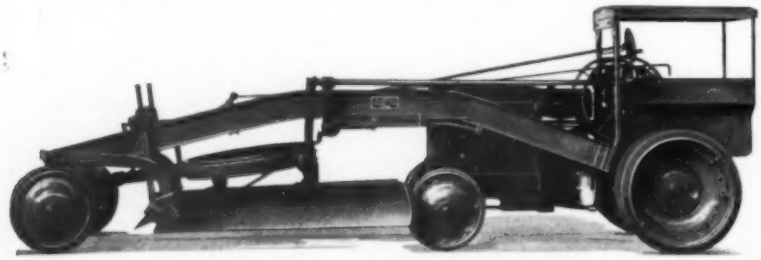
This loader is driven by a 37-horsepower 4-cylinder engine equipped with an intake air cleaner, oil filter, gasoline strainer and inbuilt governor. It has an enclosed roller and ball bearing transmission with all gears and clutches running in oil. Another feature is the feeding device, consisting of manganese steel feeding propellers as are used on the larger Haiss models. There are only five controls, making operation simple and easy. The truss type boom is balanced on a pivot shaft and raised or lowered by a hand wheel which operates worm-gear and jackknife levers. The boom is self-locking in any position. High side guards and head enclosures minimize spillage and there is also a spillage pan to return material to the loading point. There are tooth-edged 12 x 18 seamless forged buckets. The net weight of the loader is 13,600 pounds.

A Detachable Road Grader and Maintainer

ONE of the features of the No. 4 Gilbert quick-detachable road grader and maintainer is the fact that the engine is free to oscillate within the grader frame. This is not only a help in steering the outfit, but, in case the cutting edge come in contact with some unusually solid object, the drive pinion in the axle housing will climb the ring gear and act as a shock absorber.

This machine, made by the Gilbert Manufacturing Co., Stillwater, Minn., can be equipped with T-flange wheels or solid or pneumatic rubber tires. The tractor on which the machine is mounted can, of course, be equipped with either pneumatic or hard-rubber tires. The road machine can be attached to the tractor or detached from it in less than 5 minutes. The tractor is not dismantled in any way and is free for any other purpose.

The friction lock circle does away with the old bin type and when locked it becomes as rigid as a solid piece of steel. The operator sits on the seat provided by the tractor and all operating mechanisms for both the grader and tractor are at his finger tips. The two sets of front wheels are synchronized so that the whole outfit steers as easily as the tractor alone. The cab is standard equipment and is built as an integral part of the grader frame.

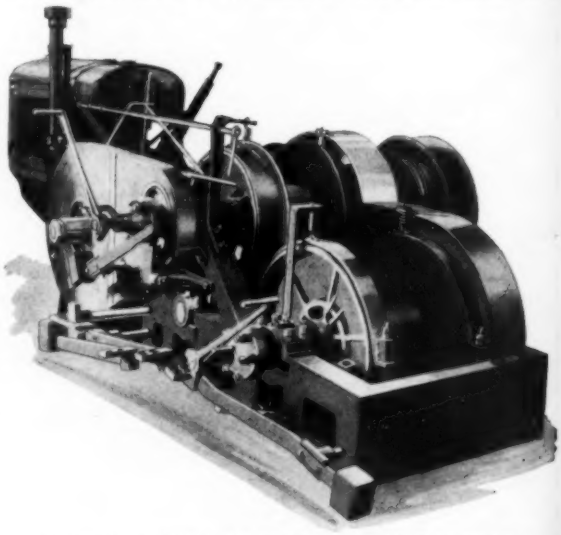


A Gilbert Quick-Detachable Road Grader and Maintainer

Hoists for Stationary or Semi-Portable Use

BUILT for heavy stationary or semi-portable use, Skagit Model AY hoists, made by the Skagit Steel & Iron Works, Sedro Woolley, Wash., are particularly adaptable for highway construction, gravel bunker work, logging and land clearing. They are made entirely of steel, giving them great strength and light weight.

For power, standard 15-30 McCormick-Deering industrial or agricultural type power units are used without any alterations other than removing the front axle assembly and the rear wheels. The drive is by means of two roller chains from sprockets on the tractor axles which utilizes the tractor transmission and affords a wide range of pulling speeds and power. In addition, several sizes of driving sprockets can be furnished which give the hoist adaptability to a wide range of work.



The Skagit Model AY Hoist for 15-20 McCormick-Deering Tractors

The forward or main drum has a capacity of 1,000 feet of 1-inch cable, with average pulls varying from 3,800 pounds at 316 feet per minute to 16,200 pounds at 74 feet per minute. The rear or haulback drum has a capacity of 2,500 feet of ½-inch cable. This drum has average pulls varying from 1,620 pounds at 742 feet per minute to 6,950 pounds at 173 feet per minute. The third drum mounted on the haulback shaft has a capacity of 2,800 feet of ⅜-inch cable with speeds and pulls the same as the haulback drum.

A complete line of Model AY special hoists is available, employing from one to five drums and adapted to a wide range of uses in the construction and building fields.

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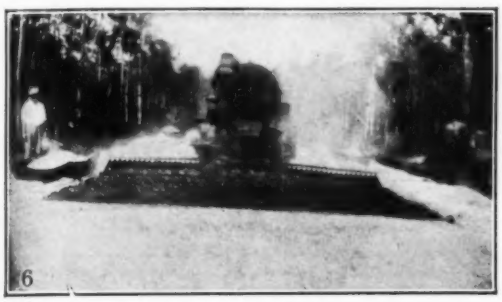
will find embodied in the 1931

"ETNYRE MODEL F"

Designed and built to maintain and produce the best kind of BITUMINOUS ROADS by applying the material in just the right amount at the proper temperature.



This is an actual photograph of an "ETNYRE MODEL F" applying 7/10 gallons per square yard, asphalt heated to 340 degrees F. with 18' spray bars on the Sanford-Orlando Road No. 3 in Florida. This is a splendid example of

"ETNYRE FULL WIDTH DISTRIBUTION"

The first application of 2 gallons per square yard was also applied with 18' spray bars.

Let us send you bulletin No. 503 giving specifications and more interesting facts.

Manufactured by

E. D. ETNYRE & COMPANY
Oregon, Illinois

SALES OFFICES IN PRINCIPAL CITIES

Here it is...JAEGER 10,000 GALLON, 2" SELF-PRIMING CENTRIFUGAL, only

$177.50
f.o.b. Columbus

Self-priming in 10 to 50 seconds.

Holds prime.

Lift over 25 feet, head up to 55 feet.

Self-adjusting gland.

Big water passages.

One-man mounting.

2—2½ h.p., 4 cycle engine or electric power.

Here's your one man, portable, 100% automatic priming centrifugal pump for the job up to 10,000 g. p. h., for the job up to 55 ft. head, for keeping a hole dry for less money than it ever cost before. Write today for catalog.

THE JAEGER MACHINE COMPANY
701 Dublin Avenue, Columbus, Ohio

GET OUR PRICES ON MIXERS, PUMPS AND HOISTS

1½ TON DODGE TRUCK

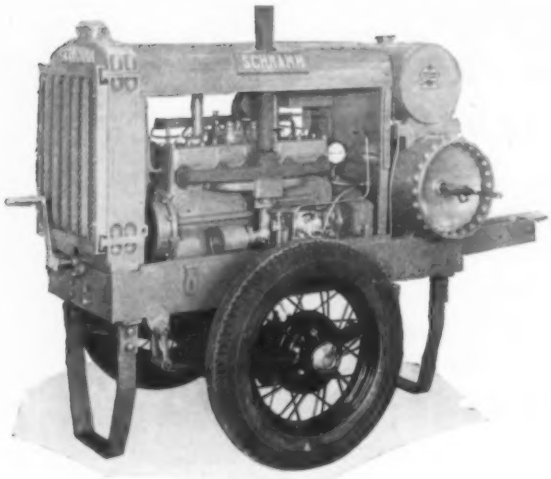
$595

CHASSIS F. O. B. DETROIT

A modern truck with many quality features

SEE YOUR NEAREST DODGE BROTHERS DEALER

PAYLOAD CAPACITIES IN THE HEAVY-DUTY LINE RANGE FROM 3,600 TO 11,175 POUNDS—AND UP, FOR TRACTOR AND TRAILER SERVICE. PRICES ARE EXCEPTIONALLY LOW. - - THE STANDARD LINE RANGES IN PAYLOAD CAPACITY FROM 1,200 TO 4,300 POUNDS AND INCLUDES THE 1½-TON CHASSIS AT . . . . . $595 F. O. B. DETROIT



The New Schramm 36-Cubic Foot Portable Compressor

A New Small Size Air Compressor

AN addition to its line of air compressors has recently been announced by Schramm, Inc., West Chester, Penna. This new compressor is a portable gasoline-engine-driven, 36-cubic foot unit, containing many of the features found in the larger Schramm models. It is a heavy-duty 6-cylinder outfit, with four power and two air cylinders. Among its features are the automatic governor, slowdown device, high tension magneto, carburetor, air filter, water circulating pump, steel housing with removable sliding doors and large single core or sectional radiator. Any of the various mountings, including the two-wheel trailer equipped with pneumatic tires, can be furnished on this new size unit.

This compressor is especially adapted for paint spray work, operating a small size non-rotating type rock drill, trench digger or clay spade, backfill tamper and concrete brushing tools.

A New Retread Mixer

FOR several years, Adams Multi-Blade road maintainers have been used by contractors for the mixing of bituminous materials, such as asphalts, tars and road oils, with gravel, stone and slag aggregates on "mixed-in-place" work. J. D. Adams Co., Indianapolis, Ind., now offers a new machine, the Adams Retread Mixer, which is similar to the maintainer but has several new features especially adapted to this type of work.

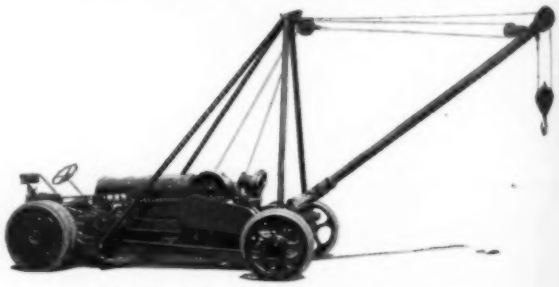
The Adams Retread Mixer Handling from 2½ to 3½ Inches of Material

The blades of this mixer are 12 inches wide and are set so as to provide sufficient throat room for a 2½ to 3-inch course of material. Three sets of blades set at a 45-degree angle zigzag the material, which has been previously covered with bituminous binder, back and forth three times in one trip, thoroughly mixing the bitumen with the aggregate. The long rear blade then evenly spreads the material to the required thickness in the same trip.

The mixing blades are rigidly mounted on the main frame, cut in the same plane, and are set to just skim the base so as to pick up and mix all of the material. The rear blade is adjustable 3 inches vertically so as to spread the course to the required depth and is in three sections which can be adjusted to spread the mix with a slight crown, if desired. All right hand blades have forward extensions to prevent the mix spilling out of line. The front and rear ends of the machine are raised and lowered independently by two convenient controls located near the driver's seat.

The advantages claimed for this equipment are that it mixes and levels the material in one operation and produces a smooth riding surface free from waves and irregularities because of its long wheel base and rigidly mounted blades.

An Industrial Tractor-Crane for Loads Up to 8,000 Pounds



The Baash-Ross Industrial Tractor Crane

THE Baash-Ross industrial tractor-crane, made by the Baash-Ross Tool Co., Los Angeles, Calif., and powered by the McCormick-Deering industrial tractor, lifts an 8,000-pound load and carries it wherever a truck will go, all under its own power.

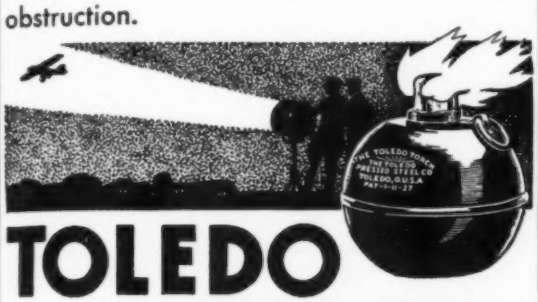
Any truck or tractor driver can handle its entire operation and all controls are operated from the driver's seat. As a crane, it has a lifting and carrying capacity of 8,000 pounds with a safe overload of 25 per cent. As a dragline or backfiller, with a single part line, it will handle loads up to 4,000 pounds. As a grab bucket excavator, it may be used with a ¼ or ⅓-yard bucket at high line speeds up to 120 feet per minute.

The tractor power is transmitted through a roller chain to the boom unit which is controlled by two levers, each operating a double cone clutch driven through a self-locking worm. The boom which is completely enclosed with all parts running in a bath of oil, has a line speed of 43 feet per minute and a swing of 1¼ revolutions per minute. The boom is of the tubular telescoping type, adjustable at 2-foot intervals. The two-drum hoist is driven by a roller chain from the boom unit. The sprocket ratio may be changed to give load line speeds of 48 to 120 feet per minute.

The hoist unit is controlled by two brake levers and two clutch pedals. The maximum single load line is 4,000 pounds and a fair leader on the front axle permits the lower load line to be brought out for applications requiring a haulback. Both load lines may go over the boom when a double load line is required.

Greater Visibility

The Toledo Torch is *seen* quicker. It compels attention and at the same time reveals the nature and extent of the obstruction.

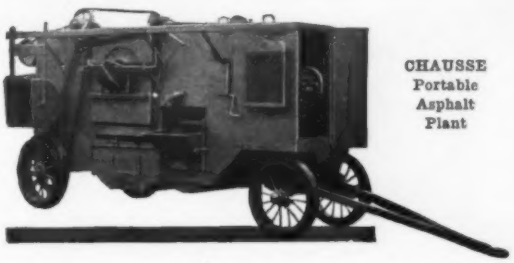


TOLEDO TORCH

The Toledo Pressed Steel Co.
TOLEDO OHIO

Save with Steel

Manufacturers of The Toledo Horse—the ideal highway barricade



CHAUSSE Portable Asphalt Plant

This Street Repair Plant is Within The Means of Every City

Almost any type of street pavement can be repaired economically and efficiently with a Chausse portable asphalt plant, the most modern unit. Asphalt, brick, concrete, oiled roads, macadam can be easily maintained.

Chausse portable asphalt plants are establishing economy records in cities like Washington, Indianapolis, Asheville, Little Rock, El Paso and elsewhere. Why not in your city! It will pay you to investigate.

Other products—Oil Burning Surface Heaters, Fire Wagons, Tar Kettles, Concrete Mixer Heaters, Kerosene Torches. Write for illustrated catalogs.

Chausse Oil Burner Company

Elkhart Indiana

For the Road Builder, Oil Well Driller, etc. "Domestic" Model 56 Ball Bearing Triplex Force Pump Units.

DOMESTIC

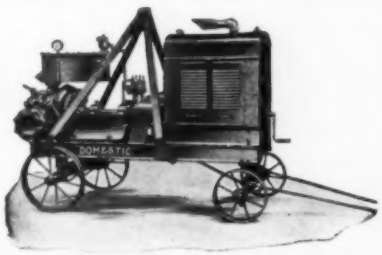
CONTRACTORS PUMPS

WATER SUPPLY PUMPS

Types: Simplex, Duplex, Triplex, and Sextuple
Capacities: 20 to 300 G.P.M.

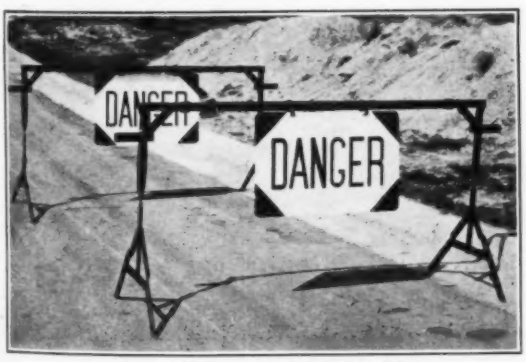
DEWATERING PUMPS

Types: Diaphragm, Plunger and Automatic Priming Centrifugal
Capacities: 80 to 2000 G.P.M.



For the Excavating, Sewer, Pipe Line and Bridge Contractor
"Domestic" Automatic Priming Ball Bearing Centrifugal Pump Units.

DOMESTIC ENGINE & PUMP CO., SHIPPENSBURG, PENNA.



Above: McCurdy Road Guard in Use
At the right: Collapsed for moving to the next job

McCurdy Road Guards

All—Steel—Adjustable—Collapsible

It's a quick and easy matter to close a street to traffic while repairs are going on, if you own a pair of McCurdy Road Guards. They are easy to transport to the job—simply carry them collapsed on your running board. You can set one of these guards up in one minute—and take it down and collapse it in one minute when the job is finished. Being made of all-steel, a McCurdy Road Guard will stand all kinds of hard knocks and won't break or wear out in many long years. It's considered everywhere the most efficient and economical road guard obtainable for street repair work. Price $5.80 each. Write for our illustrated circular.

McCurdy Steel Products Company
Ada, Ohio

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

THESE CATALOGS ARE FOR YOU

Portable Systems for Handling Bulk Cement
258 Bulletin B-4 issued by the Fuller Co., Catasauqua, Pa., describes completely the Fuller-Kinyon portable unloading and conveying system for handing bulk cement from box cars and barges to warehouse storage or direct to bulk cement plants.

A New ½-Yard Gas Shovel
259 Bulletin 345 issued by the Marion Steam Shovel Co., Marion, Ohio, announces the new Type 120, ½-yard gas shovel, dragline, clamshell and crane designed for small general excavating and material work.

Permanent Traffic Markers
260 Complete information in regard to the method of using Atlas White portland cement for traffic markers, made by inserting lines of white portland cement concrete in concrete pavement at the time it is placed, may be secured by those interested from the Universal Atlas Cement Co., 210 So. La Salle St., Chicago, Ill.

Stationary and Portable Furnaces
261 Bulletin OLM describing Connery portable and stationary furnaces for pipe line work, melting lead, sewer compounds and similar uses, will be sent on request to those interested by the Connery & Co., Inc., 4000 N. Second St., Philadelphia, Penna.

Positive and Automatic Priming Pumps
262 Sterling Machinery Corp., 2300 Holmes St., Kansas City, Mo., will be glad to send to interested contractors literature describing Sterling positive and automatic priming pumps which are made in two sizes, with three mountings and which have capacities of 15,000 gallons per hour, 18,960 gallons per hour and 24,300 gallons per hour respectively.

Cutting Costs with Power
263 Complete information in regard to Continental motors for powering construction equipment, which offer long life and economy of operation, may be secured by those interested from the Continental Motors Corp., Industrial Equipment Div., Muskegon, Mich.

Iron Pipe Railings
264 Complete data and prices on iron pipe railings for stairs, bridges and retaining walls may be secured by interested contractors from the Pipe Railing Construction Co., Fifth St., Long Island City, N. Y.

Warning Lanterns
265 Complete information in regard to Dietz Red lanterns, among the features of which are sure protection and low cost, will be sent on request to those interested by the R. E. Dietz Co., 60 Laight St., New York City.

Reinforced Concrete Pipe
266 Newark Concrete Pipe Co., 323 Broadway, Newark, N. J., will be glad to send to those interested complete information in regard to Newark reinforced concrete pipe which has a sufficiently flexible joint to permit accurate laying to grade.

A 1-Cubic Yard Excavator
267 National Equipment Corp., N. 30th St. and W. Concordia Ave., Milwaukee, Wis., will be glad to send to those interested a copy of its 48-page catalog describing the Koehring 401 1-cubic yard excavator which may be operated as a shovel, pull shovel, crane or dragline with either gasoline, oil diesel or electric power.

Crawler Tractors for Every Purpose
268 Form 599 describing the line of Cletrac crawler tractors and a number of novel and interesting uses to which these tractors have been put in the construction field may be secured by those interested from the Cleveland Tractor Co., 19321 Euclid Ave., Cleveland, Ohio.

Portable Pumping Units
269 Homelite Corp., 71 Riverdale Ave., Port Chester, N. Y., will be glad to send to those interested complete information in regard to Homelite portable self-priming centrifugal pumps which require no auxiliary vacuum apparatus, no foot valves, no adjustment when changing from volume to seepage or vice versa, and which are sturdy and dependable for out-of-door use.

A Tractor-Mounted Brush Cutter
270 The LaPlant-Choate brush cutter, designed for use with Caterpillar Sixty and Thirty tractors, the larger size of which is said to clear 10 to 12 acres of brush and small timber a day, is described in literature which the LaPlant-Choate Manufacturing Co., Cedar Rapids, Iowa, will be glad to send on request.

A Book of Construction Jobs
271 The McKiernan-Terry "Book of Construction Jobs," describing the use of McKiernan-Terry hammers, pile drivers, Lambert-National hoists and other handling equipment on various large construction projects may be secured by those interested from the McKiernan-Terry Corp., 19 Park Row, New York City.

A New 1½-Ton Truck
272 The new International 1½-ton Model A-2 truck which is available in either 136 or 160-inch wheelbase and which is powered with an engine with an improved high compression cylinder head, is described in literature which may be secured from the International Harvester Co. of America, 606 So. Michigan Ave., Chicago, Ill.

Rotary Scrapers for Dirt Moving
273 Euclid Road Machinery Co., Cleveland, Ohio, will be glad to send to those interested complete information in regard to Euclid rotary scrapers which are designed for economical dirt moving behind tractors of 15 to 60 drawbar horsepower.

Five to Fifteen-Ton Rollers
274 Complete information in regard to 5 to 15-ton 4-cylinder motor rollers for road work may be secured by interested contractors from the Huber Manufacturing Co., 330 E. Center St., Marion, Ohio.

A Centrifugal Portable Pump
275 The Evinrude portable centrifugal pump which can handle 15,240 gallons of water per hour at a 5-foot head and which can clear a 200-foot ditch 30 inches wide and 8 feet deep of 3 feet of water in an hour on one gallon of gasoline is described in literature which may be secured from the Evinrude Div., Outboard Motors Corp., 3324 No. 27th St., Milwaukee, Wis.

A Powerful ½-Yard Shovel
276 General Excavator Co., 220 Rose St., Marion, Ohio, will be glad to send to those interested a complete descripton, as well as the name of the nearest distributor, of the General ½-yard shovel which is powered with a 62 to 71 horsepower 6-cylinder engine.

An Economical Cost Cutter
277 The Ellis pipe cutter which has six keen rotary cutting blades and which will cut all kinds of pipe from 4 to 12 inches in diameter, is described in literature which the Ellis & Ford Manufacturing Co., 32 Piquette Ave., Detroit, Mich., will be glad to send on request.

Reinforced Roads and Streets
278 This is the title of a booklet describing the use and advantages of wire fabric reinforcing for concrete roads and streets to increase the life of the pavement and cut down maintenance costs. Copies of this booklet may be secured by those interested from the American Steel & Wire Co., 208 So. La Salle St., Chicago, Ill.

(Cut or tear along this line)

CONTRACTORS AND ENGINEERS MONTHLY
470 Fourth Avenue, New York

Gentlemen: Please send me the following literature, without cost or obligation.

.....
(Indicate by numbers)

Name .....**Firm Name**.....

Address .....
(Street and Number) *(City and State)*

72 pages of helpful hints and illustrations pertaining to cut-and-fill work, levee, dam and reservoir construction, etc.

How to Cut Dirt-Moving Costs

SAUERMAN Drag Scrapers can cut your overhead charges and put you in a position to bid lower on long range work. Send for the new Scraper Handbook (shown at left) and see for yourself how a Sauerman machine, operated by one man, has saved money on a multitude of jobs by serving as excavator and conveyor combined.

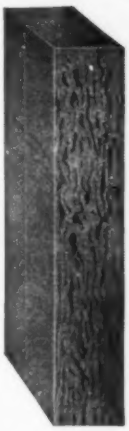
SAUERMAN BROS., INC.
464 S. Clinton Street . . . Chicago

Haul Bigger Payloads

at lower cost, with the Williams "Arch Girder" - - the original trailer built for extra strength without increased weight. *Write for Bulletin TR-9.*

G. H. WILLIAMS COMPANY
609 Haybarger Lane, Erie, Pa.
Branch Offices: New York Pittsburgh Cleveland Chicago

WILLIAMS
TRAILERS — BUCKETS



Type "B" Servicised Expansion Joint is of special quality asphalt and selected fibers — very low in moisture absorption—and with unusual conformity to expansion and contraction movements together with maximum control of oozing.

This Reinforced Expansion Joint was developed for requirements demanding rigidity and strength in fillers. The core of fiber is heavily saturated with high-quality asphalt and reinforced on the sides by sheets of saturated felt.

Servicised Expansion Joint Suitable for every condition—hot, cold, wet, dry

Servicised Expansion Joints *take care of temperature and moisture variations.* They not only prevent the cracking and self-destruction of pavements, sidewalks, etc., but they preserve indefinitely the tightness, alignment, permanency and original form of any and every portion of a monolithic structure. Their small cost adds little to the original outlay, and is quickly made up, many times over, out of the savings in maintenance. *Let us send you a copy of our Catalog No.* 11.

Sponge Rubber Joint
Asphalt Rubber Joint

Telephone: Grove Hill 0423

SERVICISED PRODUCTS CORPORATION
6051 W. 65th Street Chicago, Ill.

AIR COMPRESSORS

Portable and Stationary

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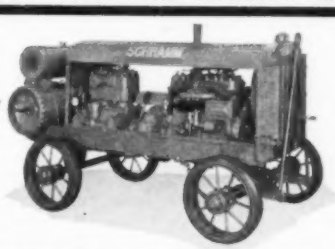
Any style mounting



1 to 720 cu. ft. displacement

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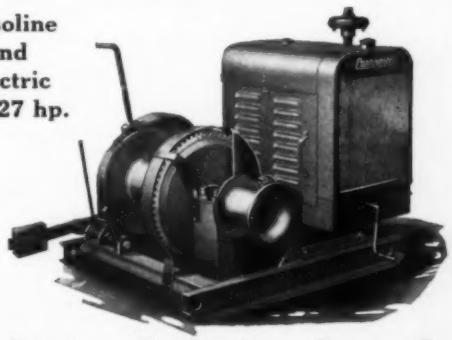
SCHRAMM, Inc.
WEST CHESTER, PA.

REPRESENTATIVES IN ALL IMPORTANT CITIES

Gasoline and Electric 2 to 27 hp.



Combining Enduring Strength, Efficiency and Light Weight

These desirable features are paramount in the design and construction of

DAKE Type "S-LG" Hoists

The rolled-steel base, standards and drums, arc-welded and braced with tubes and angles, give greater strength and rigidity. The more uniform strength and elasticity of rolled steel also makes them practically unbreakable.

Dake hoists have ample, reliable power units and every convenience for safe and efficient operation.

The elimination of all unnecessary weight makes them handier for setting up on the job and more suitable for elevating to upper stories of buildings under construction.

Send for Bulletin 32

DAKE ENGINE COMPANY
Grand Haven, Mich., U. S. A.

Having four types . . . Orange Peel, Clam Shell, Electric Motor, and Drag Line . . . of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

THE HAYWARD CO.
32-36 Dey St. New York, N. Y.

Hayward Buckets

Steel Trailing Forms for Macadam Paving

279 Complete information regarding the new Heltzel mechanical trailer forms with which contractors have already cut macadam costs may be secured from the Heltzel Steel Form & Iron Co., Warren, Ohio.

A Ditch Dredger and Cleaner

280 The new Model H, Type O Ruth dredger with patented automatic self-cleaning buckets and adjustable to widths and slopes of canal or ditch is completely described and illustrated in the literature of the Ruth Dredger Manufacturing Corp., Ltd., 5980 South Boyle Ave., Los Angeles, Calif.

An Improved Dragline Bucket

281 The improved Williams Double-Arch dragline bucket, among the features of which are a rugged steel bridge and reinforcing plates, the arch design at the top and bottom, and improved tooth design, is described in literature which those interested may secure from the G. H Williams Co., 609 Haybarger Lane, Erie, Penna.

Side and Rear Dump Trucks

282 The new Wood Threeway hoist and body dumping unit for any size and type of truck chassis, recently announced by the Wood Hydraulic Hoist & Body Co., Detroit, Mich., is described in Bulletin No. 9 which is available on request.

Moving Big Loads Quickly

283 Literature regarding the Trail-It dump wagon which is capable of moving big loads at a rapid rate over all ground conditions, may be secured without obligation from the Trail-It Co., St. Paul, Minn.

Hoists for Stationary or Semi-Portable Use

284 Built for stationary or semi-portable use, Skagit Model AY hoists, made by the Skagit Steel & Iron Works, Sedro Woolley, Wash., are particularly adaptable for highway construction, gravel bunker work, logging and land clearing. Complete details are available on request.

A Detachable Road Grader and Maintainer

285 Details regarding the No. 4 Gilbert quick-detachable road grader and maintainer, made by the Gilbert Manufacturing Co., Stillwater, Minn., will be sent on request to interested contractors.

A Bulletin on a 1½ and 1¾-Yard Excavator

286 Bulletin FBE-431 issued by the Bucyrus-Erie Co., South Milwaukee, Wis., describes the new 43-B 1½ and 1¾-yard Bucyrus-Erie machine which is available as either shovel, dragline, clamshell or lifting crane, driven by gasoline, diesel or electric power.

A Complete Line of Portable Compressors

287 A new 32-page bulletin, PC4, describing and illustrating the various sizes and mountings of the Gardner-Denver line of portable air compressors, has recently been issued by the Gardner-Denver Co., Quincy, Ill. Copies may be secured from the company on request.

A New Heavy-Duty Hydraulic Hoist

288 Perfection Steel Body Co., Galion, Ohio, will be glad to send to those interested complete information in regard to the new hydraulic hoist for steel dump bodies for mounting on Ford and Chevrolet chassis.

The Use of X-Ray Tests

289 As an effective supplement to its other laboratory services, the Robert W. Hunt Co., Insurance Exchange, Chicago, Ill., now offers the facilities of an X-ray laboratory of the latest and most modern design and of ample capacity for industrial requirements. This new service is described in a folder which may be secured on request.

5, 7 and 8-10-Yard Crawler Dump Wagons

290 Bulletin W-31-H describing Western crawler dump wagons which are made in 5, 7 and 8-10-yard sizes, can be used with any available crawler tractor and have the Western spring wind-up feature, may be secured by those interested from the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill.

A New Sand and Gravel Spreader

291 Universal Road Machinery Co., Kingston, N. Y., will be glad to send to interested highway contractors complete information in regard to its new Reliance sand and gravel spreader which can be operated with any standard dump truck, which spreads fine or coarse sand or sand and gravel handling up to 60 tons an hour and spreading a heavy cover of from 8 to 12 feet and sand any width up to 30 feet.

A New Light Haulage Gasoline Locomotive

292 Bulletin TLF describes the new light haulage Ford-engine-powered 4-speed transmission industrial locomotive recently announced by the Fate-Root-Heath Co., Plymouth Locomotive Works, Plymouth, Ohio. This locomotive is furnished in 2½, 3, 3½ asd 4-ton sizes.

Asphalt Emulsion Sprayers

293 Catalog sheet No. 753 recently issued by the Hauck Manufacturing Co., 104-114 Tenth St., Brooklyn, N. Y., describes the use of the No. 398 Hauck power sprayer for asphalt emulsion for curing concrete and its use as a cold tar and asphalt emulsion sprayer for spreading emulsion on maintenance work.

A Power Drag Scraper That Turns Corners

294 A patented "dog-leg" device which permits a right-angle turn in the path of a power drag scraper, has been announced by Sauerman Bros., 464 South Clinton St., Chicago, Ill. A complete description of this device which greatly extends the usefulness of this piece of excavating and rehandling equipment may be secured direct from the manufacturer.

Hydraulic Tables and Other Data

295 Bulletin No. 25 issued by the Baldwin-Southwark Corp., Philadelphia, Penna, contains tables and data for the engineer engaged in the design or use of mechanism for producing load by hydraulic means. Some of the data have never appeared in print before, including data on accumulators, pump intensifiers and shock valves. Copies of this bulletin are available on request from the above company to those stating name, position, company with which affiliated and address. Please mention this magazine.

A Large Capacity Pump for Low Head Work

296 A skid-mounted or portable centrifugal pump capable of handling 750 gpm on low head work and equipped with special alloy steel impellers for wear resistance purposes has been announced by the LaBour Co., Inc., Elkhart, Ind., in its No. 40 Type DPL pump. A description and illustration of this pump will be furnished on request.

A New 7-Yard Crawler Wagon

297 Trackson Co., 1323 So. First St., Milwaukee, Wis., will be glad to send to those interested a complete description of the new Trackson 7-yard bottom-dump crawler wagon, among the features of which are extra-strong front and rear ends, improved tongue and drawbar connections, a sturdy body that sheds the dirt, a simple, easily-operated door-winding device, light weight, renewable parts and Trackson 15-ton crawler wheels.

A 110-Cubic Foot Compressor for Use on Small Trucks

298 Complete information in regard to the Davey 110-cubic foot air-cooled compressor which is powered by a Ford Model A industrial motor and is designed for mounting on a standard short wheelbase Ford truck chassis may be secured by those interested from the Davey Compressor Co., Kent, Ohio.

A Heavier Motor Grader for Highway Work

299 The Adams No. 15 motor grader, which is of the same general design as the No. 101, is powered by a Case Model LI tractor and is furnished with a 10, 12, 14 or 16-foot blade, with or without scarifier, is described in literature which the J. D. Adams Co., Indianapolis, Ind., will be glad to send on request.

A Heavy-Duty Hydraulic Scraper

300 The Shaw heavy-duty, one-man-operated scraper, which loads natural soils without plowing or rooting in low speeds and travels, dumps and spreads in high speeds, and is made in two sizes, a 4-yard level capacity for large tractors and a 2¼-yard level capacity for medium tractors, is described in literature which the Shaw Excavator & Tools Co., Worthington, Ohio, will be glad to send on request.

A New 4-Ton Heavy-Duty Truck

301 Complete information in regard to the new heavy-duty 4-ton 6-cylinder Speedwagons recently announced may be secured by those interested from the Reo Motor Car Co., Lansing, Mich.

A Tractor-Powered Roller

302 The Davenport-Winchell roller made by the Davenport Locomotive & Manufacturing Corp., Davenport, Iowa., is an all-purpose unit combining the desirable features of low initial cost, dependability and unusual operating economy. Full details regarding this roller may be secured without obligation from the manufacturer.

A New Portable Electric Hand Saw

303 The United States Electric Tool Co., Dept. 95, 2490 West 6th St., Cincinnati, Ohio, will be pleased to send complete information regarding its new electric hand saw which weighs but 26¼ pounds and will handle 96 per cent all sawing needed on buiding materia and forms.

A Quick-Acting Mobile Crane

304 Thaleg & Hock, Inc., 236 North Clark St., Chicago, Ill., manufacturers of the Travel-Crane, will be pleased to receive inquiries regarding this moderate-priced, quick-acting mobile crane, which was developed for use where a large crane is not economically adapted.

Steel Storage Bins for Proportioning and Mixing Plants

305 Blaw-Knox steel storage bins and measuring equipment for proportioning concrete aggregates, cement and water, and ready-mixed concrete plants as well as truck mixing and agitating bodies for the delivery of ready-mixed concrete, are described in Catalog No. 1302 which the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna., will be pleased to send on request.

A Warning Torch for Construction Work

306 The new Cleveland Flaming Torch which will produce a full visible flame for from 36 to 48 hours with one filling and which is 9 inches tall and 7¾ inches in diameter is completely described in a folder which may be secured from the Consolidated Iron-Steel Mfg. Co., 1293 E. 53rd St., Cleveland, Ohio.

A New Trailer Air Compressor

307 Ingersoll-Rand Co., 11 Broadway, New York City, will be glad to furnish to those interested complete information in regard to the Speed Trailer, a new portable air compressor designed for high-speed towing and consisting of a standard 5½ x 5-inch gasoline-engine-driven compressor mounted on two rubber-tired steel wheels.

A 4-Yard Gravity Dump Wagon

308 A complete description of the Hughes-Keenan Iron Mule with a 4-yard gravity dump body for use with a McCormick-Deering Model 20 and an Allis-Chalmers Model-U industrial tractor may be secured by those interested from the Hughes-Keenan Co., Mansfield, Ohio.

A New Self-Priming Centrifugal Pump

309 A complete description of the new self-priming centrifugal pump, made in 3, 4 and 6-inch sizes with capacities ranging from 400 to 1,400 gpm, may be secured by interested contractors from the Novo Engine Co., 216 Porter St., Lansing, Mich.

A New Safety Brake for Hoists

310 A new patented automatically-operated safety brake which is set by weight has been developed by the J. S. Mundy Hoisting Engine Co., 722 Frelinghuysen Ave., Newark, N. J., for use on hoists. A complete description of this gravity-operated brake will be furnished to contractors free on request.

A New Blade Spreader with Straight-Edge

311 A new tool for spreading of traffic bound, gravel or earth roads and specially adapted to the spreading of ready-mixed or mixed-in-place bituminous material on roads, known as Gledhill road adjuster, has been announced by the Gledhill Road Machinery Co., Galion, Ohio. Illustrated Bulletin No. 21 describing this machine may be secured from the manufacturer.

Crushers and Pulverizers for Tractor Power

312 O. B. Wise Pulverizer Co., Knoxville, Tenn., makes a line of crushers and pulverizers designed and built for tractor operation regarding which it will gladly send information and prices.